National Antimicrobial Resistance Monitoring System

2011

Executive Report

CDC Centers for Disease Control and Prevention
FDA
USDA

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I. Introduction

A. Executive Report

This report summarizes, in an integrated format, the National Antimicrobial Resistance Monitoring System data on *Salmonella* (non-typhoidal) and *Campylobacter* recovered in 2011 from human clinical cases, retail meats, and food animals at federally inspected slaughter and processing plants. The report also includes susceptibility data for *Escherichia coli* recovered from retail meats and chicken carcasses. Summary data from prior years are also included.

Suggested Citation: FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2011 Executive Report. Rockville, MD: U.S. Department of Health and Human Services, Food and Drug Administration, 2013.

B. NARMS Program

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

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

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

The following are the primary objectives of NARMS:

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

C. NARMS Components

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

1. Human Component

The human component of NARMS was launched in 1996 within the framework of CDC's Emerging Infections Program and the Foodborne Diseases Active Surveillance Network (FoodNet). Initially, it included non-Typhi *Salmonella* and *Escherichia coli* O157 isolates from 14 state and local health departments. In 1999, *Salmonella* serotype Typhi and *Shigella* testing was added. By 2003, NARMS conducted nationwide surveillance of *Salmonella*, *Shigella*, and *E. coli* O157 from humans. Testing of *Campylobacter* from humans began in 5 FoodNet sites in 1997 and expanded to all 10 FoodNet sites by 2003. In 2009, NARMS began testing *Vibrio* species other than *V. cholerae* from all 50 states. Antimicrobial susceptibility testing of NARMS human isolates is performed at CDC's laboratories in the National Center for Emerging and Zoonotic Infectious Diseases in Atlanta, Georgia.

2. Retail Meat Component

The retail meat component of NARMS was launched in 2002. Retail meat surveillance is conducted through collaboration with state departments of public health.[1] Participating sites purchase chicken, ground turkey, ground beef, and pork chops at retail stores and culture them for *Salmonella.* Retail poultry is also cultured for *Campylobacter*. [2] Additionally, four sites culture retail meats for *E. coli* and *Enterococcus*.[3] Isolates are sent to CVM's Office of Research in Laurel, Maryland for species and serotype confirmation, antimicrobial susceptibility testing, and genetic analysis.

3. Animal Component

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

D. Links to Additional Information

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

[1] Most of the retail meat sites are FoodNet sites. The Pennsylvania Department of Health joined the NARMS retail meat surveillance program in 2008.
[2] Before 2008, FoodNet retail meat sites also tested ground beef and pork chops samples for *Campylobacter*. Pennsylvania tested retail meats only for *Salmonella* in 2008 and began testing retail poultry for *Campylobacter* in 2009.
[3] From 2002 through 2006 and 2010 through 2011, four sites cultured retail meats for *E. coli* and *Enterococcus*, and from 2007-2009, three sites cultured retail meats for *E. coli* and *Enterococcus*.

FDA: http://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/default.htm

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

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

Information about the Foodborne Diseases Active Surveillance Network (FoodNet) can be found on the following CDC website: http://www.cdc.gov/foodnet/

II. NARMS 2011 Executive Report Summary

This section summarizes the major findings of the National Antimicrobial Resistance Monitoring System (NARMS) for bacteria collected from humans, retail meats and food animals in calendar year 2011. NARMS testing dates back to 1996 and generates a large, complex set of data each year. FDA, CDC, USDA and others inside and outside government make use of these data to assess risks associated with foodborne microbial hazards, particularly those carrying antibiotic resistance. To highlight the most important findings, we have summarized results from the testing of *Salmonella*, *Campylobacter*, and generic *E. coli* in this report.

This summary focuses on resistance to drugs that are considered clinically important to human medicine as well as multidrug resistance patterns (described as resistance to three or more antibiotic classes) and specific co-resistant phenotypes that have been linked to severe illness in humans. Because some serotypes of *Salmonella* are more commonly found in specific animal hosts and because resistance patterns are often associated with particular serotypes, the distribution of both selected serotypes and selected resistance patterns in human, retail meat, and food animal isolates are also provided to give important information on the epidemiology of antibiotic resistance. For more details on the monitoring results and other information related to the program, refer to other sections of this report and individual agency NARMS 2011 reports for human, retail meat, and food animal isolates.

A. Important Observations

Non-Typhoidal *Salmonella*

Why It Matters

- Non-typhoidal *Salmonella* (i.e., serotypes other than Typhi, Paratyphi A, Paratyphi B, and Paratyphi C) usually causes diarrhea, fever, and abdominal cramps. Some infections spread to the blood and can be life-threatening.
- According to the CDC, non-typhoidal *Salmonella* causes approximately 1.2 million illnesses, 23,000 hospitalizations, and 450 deaths each year in the United States. Direct medical costs are estimated to be $365 million annually (CDC, 2013).
- Physicians rely on antibiotics such as ceftriaxone and ciprofloxacin for treating patients with severe *Salmonella* infections.
- Non-typhoidal *Salmonella* can sometimes be resistant to important antibiotics such as:
    - ceftriaxone
    - quinolones (ciprofloxacin and nalidixic acid)
    - multiple classes of drugs
- CDC estimates that drug-resistant non-typhoidal *Salmonella* causes 100,000 infections and 40 deaths per year (CDC, 2013).

Important Resistance Trends in 2011

- No resistance was detected in 85% of non-typhoidal *Salmonella* isolates from humans.
- Ciprofloxacin and nalidixic acid resistance remained less than 3% from all sources.
- Multi-drug resistance (MDR) among human, slaughtered chicken and slaughtered swine *Salmonella* isolates was the lowest since testing began.
- MDR in *Salmonella* isolates from retail poultry meats generally increased, with slight fluctuations.
- MDR in serotype I 4,[5],12:i:- isolates from humans continued to increase; a similar trend was observed among isolates from chickens at slaughter.

Campylobacter

Why It Matters

- CDC estimates that *Campylobacter* causes 1.3 million infections, 13,000 hospitalizations, and 120 deaths each year in the United States (CDC, 2013).
- *Campylobacter* usually causes diarrhea (often bloody), fever, and abdominal cramps, and sometimes causes serious complications.
- Physicians rely on drugs like ciprofloxacin and azithromycin for treating patients with severe disease.
- *Campylobacter* can sometimes be resistant to important antibiotics such as:
    - ciprofloxacin
    - erythromycin
- CDC estimates that drug-resistant *Campylobacter* causes 310,000 infections and 28 deaths per year (CDC, 2013).

Important Resistance Trends in 2011

- Erythromycin resistance in *C. coli* isolates from human, retail chicken and slaughtered chicken are near the lowest levels seen in several years.
- Erythromycin and gentamicin resistance in *C. jejuni* isolates from humans and chicken sources has remained less than 4% since NARMS testing began.
- 55% of *C. jejuni* and 64% of *C. coli* isolated from human clinical samples were resistant to at least one antibiotic.
- Gentamicin resistance in *C. coli* from isolates from retail chicken meat and chickens at slaughter has continued to increase since 2007.
- 2005 was the last year that fluoroquinolone drug use was permitted in poultry. Since then, there has been some increase in ciprofloxacin (a type of fluoroquinolone) resistance in human isolates of *Campylobacter,* more for *C. coli* than for *C. jejuni*. The picture is mixed for chicken sources, but there has been no definite overall decrease in resistance in isolates from chicken sources.

Escherichia coli

Why It Matters

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

Important Resistance Trends in 2011

- Ceftriaxone resistance among *E. coli* isolates from retail chicken increased from 8% in 2002 to 13% in 2011; ground turkey isolates showed a larger increase in resistance during the same time period (from 1% to 10%). There was a similar trend in *Salmonella* isolates.
- Ceftriaxone resistance among isolates from slaughtered chicken increased from 6% in 2000 to 12% in 2010, and then dropped slightly to 9% in 2011. This was the first decline observed in the last 3 years.

B. Major Findings

Non-Typhoidal *Salmonella*

Every year, an estimated 1.2 million people get sick from non-typhoidal *Salmonella* infection in the United States. Of these, approximately 23,000 are hospitalized, and 450 die from their infections. Many of these infections are foodborne.

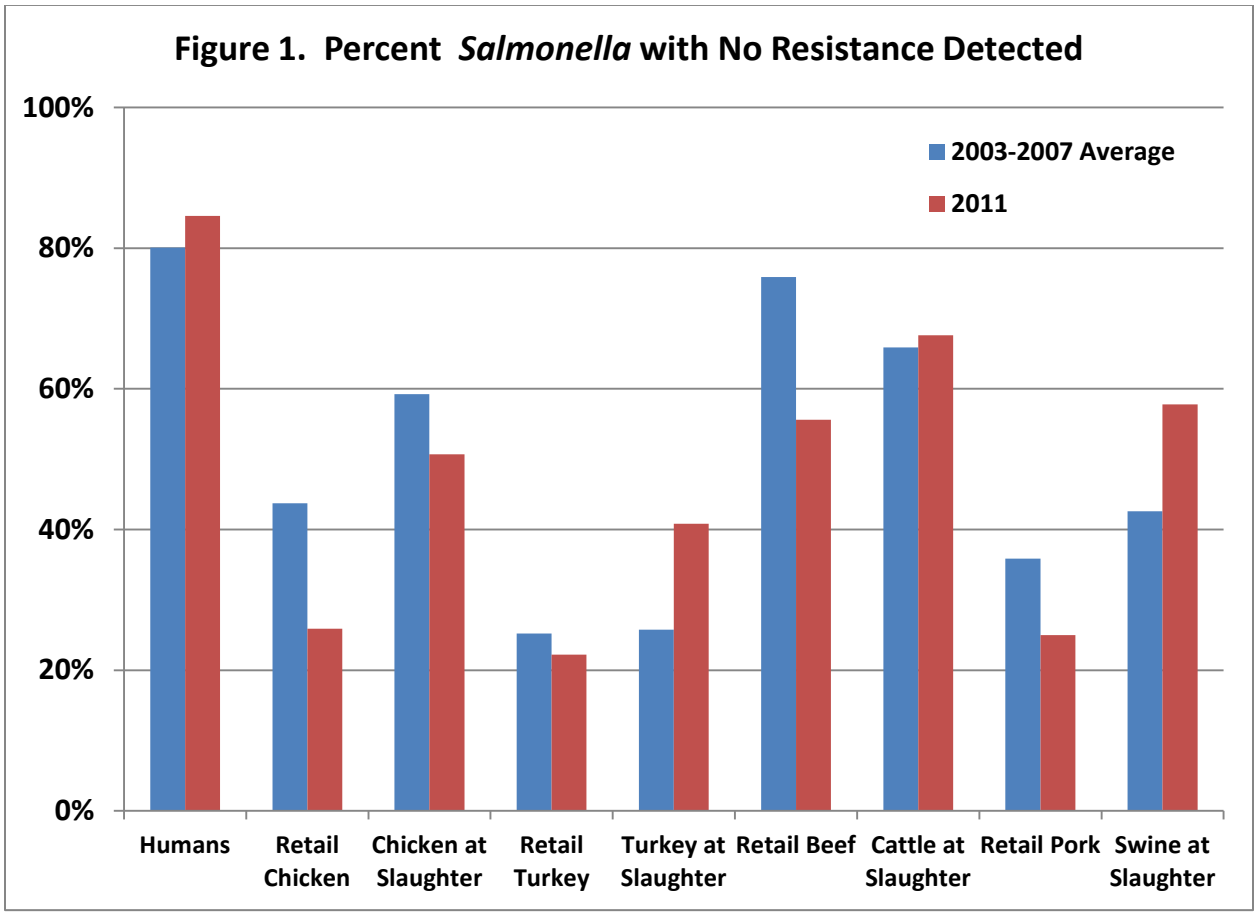
Number of Isolates Tested

A total of 3,725 non-typhoidal *Salmonella* isolates were tested, consisting of 2,344 from humans, 357 from retail meats, and 1,024 from healthy food animals at slaughter. *Salmonella* was isolated from 12% of ground turkey, 12% of retail chicken 2% of pork chops and 1% of ground beef samples.

No Resistance Detected

Figure 1 shows the proportion of *Salmonella* with no resistance to any of the agents tested in NARMS. Data from 2011 are compared with an average combined percentage from 2003-2007 to display general trends. In 2011, NARMS found that 85% of *Salmonella* isolated from humans had no resistance to any of the antibiotics tested, up from an average of 80% in previous years. Among retail poultry and poultry at slaughter, the percentage of isolates with no resistance declined in 2011, with the exception of turkeys at slaughter which increased (Figure 1.). Bovine isolates (cattle and retail beef) were more likely to have no resistance to any antibiotic tested, when compared with isolates from other food animal sources. Among retail beef, the percentage of isolates with no resistance also declined relative to the 5 year average, whereas in cattle at slaughter the percent of isolates with no resistance increased (Figure 1). Similarly the percentage of isolates with no resistance declined in retail pork and increased in swine at slaughter (Figure

1). Overall, the data present a mixed picture, with increases in resistance in some sampling frames and decreases in others.



Quinolones

In the United States, fluoroquinolones (like ciprofloxacin) are commonly used to treat severe *Salmonella* infections. Fluoroquinolones are also approved for the treatment and control of certain respiratory infections in swine and cattle, but these agents are not currently approved for use in poultry (Animal Drugs @ FDA). In addition, extra-label use of fluoroquinolones in food-producing animals is expressly prohibited. During its 16-year history, NARMS has found *Salmonella* resistance to ciprofloxacin to be less than 0.5% among human isolates, less than 3% among retail meat isolates and less than 1% among animals at slaughter.

During its 16-year history, NARMS has found *Salmonella* resistance to ciprofloxacin to be less in 0.5% among human isolates, less than 3% among retail meat isolates and less than 1% among animals at slaughter.

NARMS monitors *Salmonella* for resistance to nalidixic acid, as an early indicator of emerging resistance to fluoroquinolones (Crump et al., 2003). Nalidixic acid resistance among *Salmonella*

from humans, chickens (retail and slaughter), cattle and swine has remained less than 3% since testing began, and nalidixic acid resistance among *Salmonella* from turkeys (retail and slaughter) has remained less than 3% since 2004. NARMS has observed a steady increase in nalidixic acid resistance among *Salmonella* serotype Enteritidis isolates from humans (from as low as 0.9% in 1996 to 7.2% in 2011), but many of these infections were likely acquired during foreign travel. No increase has been seen among the domestic retail meat or food animal isolates tested by NARMS.

Cephems

Ceftriaxone is considered a critically important drug for treating severe *Salmonella* infections (Pueges and Miller, 2010). A closely related cephalosporin antibiotic, ceftiofur, is licensed for use in food animal production (Animal Drugs@FDA). Historically, the same molecular mechanism has been responsible for resistance to both ceftriaxone and ceftiofur in NARMS isolates. Long term analysis of resistance trends revealed that overall ceftriaxone resistance has increased in *Salmonella* isolates from all sources since testing began. These and other data led to the April 2012 cephalosporin order which prohibits certain unapproved uses of cephalosporin drugs in cattle, swine, chickens and turkeys (http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm285704.htm). In 2011, NARMS observed a continued rise in ceftriaxone resistance among retail ground turkey isolates (from a low of 5% in 2008 to 22% in 2011) and among certain serotypes in cattle (from a recent low of 59% in 2009 to 77% in 2011 among isolates of serotype Newport). NARMS will continue to monitor these trends over time.

Continued rise in ceftriaxone resistance led to the April 2012 cephalosporin order of prohibition which prohibits certain unapproved uses of cephalosporin drugs in cattle, swine, chickens and turkeys.

Beginning in 2011, all *Salmonella* isolates that were resistant to ceftriaxone and/or ceftiofur were screened for resistance genes and tested for susceptibility to other related drugs including imipenem (a carbapenem) and cefepime (a cephem). In 2011, one human isolate was resistant to both imipenem and cefepime; molecular characterization of this isolate revealed the presence of a gene encoding a New Delhi metallo-β-lactamase (NDM) carbapenemase. The NDM carbapenemase gene induces resistance to carbapenems, which have become antibiotics of last resort for treating human infections caused by gram-negative bacteria. Carbapenems are not approved for use in food animal production (AnimalDrugs@FDA). None of the *Salmonella* isolates from any animal source that underwent this extra testing showed imipenem resistance or carbapenemase production.

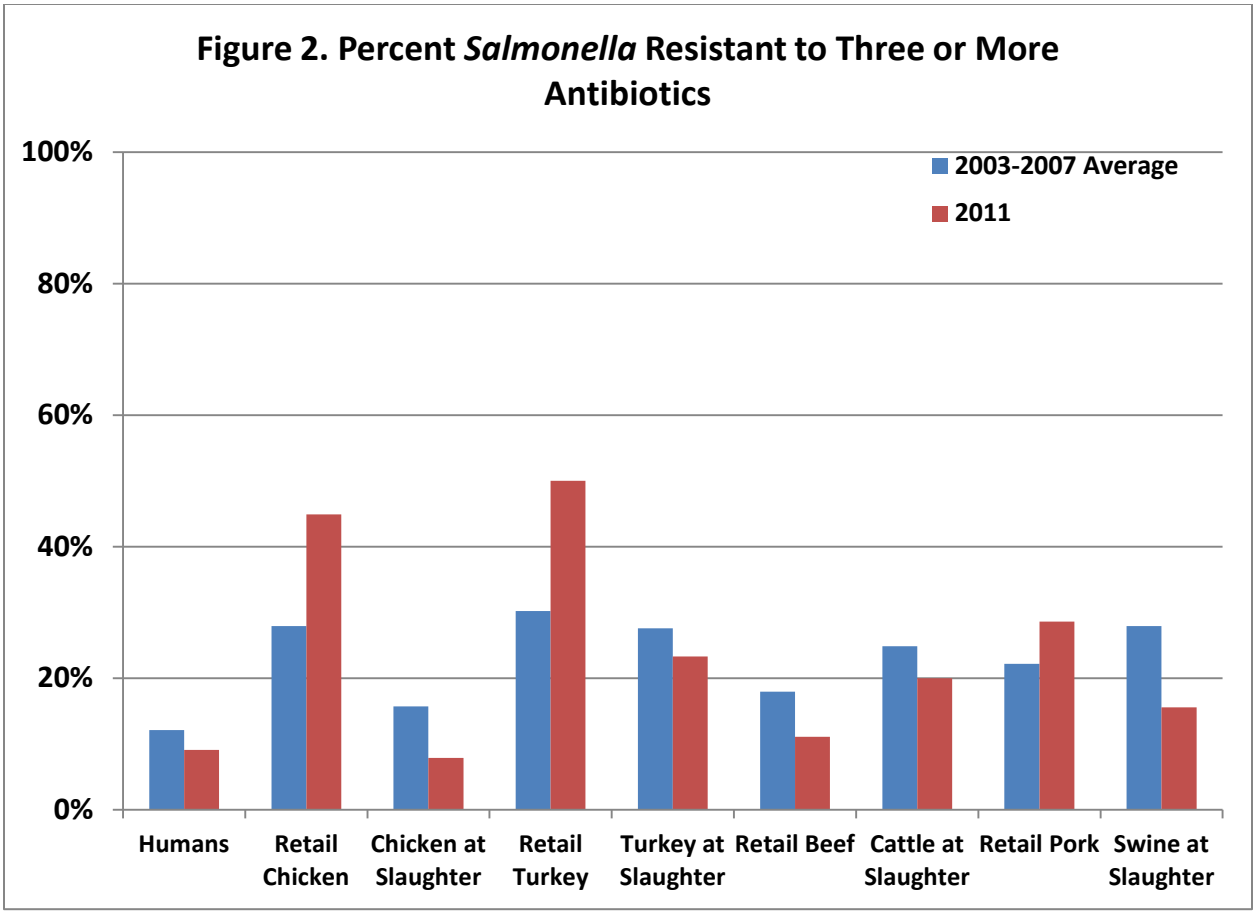
In 2011, one human-source *Salmonella* isolate was resistant to both imipenem and cefepime and found to have a carbapenemase gene. None of the *Salmonella* isolates tested for imipenem resistance from any domestic animal source showed resistance or carbapenemase production.

Multidrug Resistance

MDR *Salmonella* among human (9%), slaughtered chicken (8%) and slaughtered swine (16%) isolates in 2011 were the lowest since testing began.

NARMS defines multi-drug resistance (MDR) as resistance to 3 or more classes of antibiotics. Some studies have shown that some patients with MDR *Salmonella* infections tend to have more severe clinical disease (Krueger, et al. 2014; Varma et al., 2005a; Varma et al, 2005b). It is important to note that some of the drugs included in the MDR resistance patterns are not used to treat *Salmonella* infections.

As described above for Figure 1, general trends in MDR were compared using a 5-year average (2003-2007) as a baseline. The prevalence of MDR in *Salmonella* isolated from humans declined from 12.1% in 2003-2007 to 9.1% in 2011. MDR increased among ground turkey isolates from a baseline of 30% to 50% in 2011. In retail chicken isolates, MDR increased from a baseline of 28% to 45% in 2011, after peaking at 49% in 2009. When the 2011 resistance levels from retail turkey and retail chicken are compared to the 5 year baseline, this increase appears to be the largest among the 9 sources tested in NARMS (Figure 2). MDR *Salmonella* among human (9% in 2011), slaughtered chicken (8%), and slaughtered swine (16%) isolates have declined in 2011 to the lowest levels since testing began. MDR resistance among retail beef and slaughtered turkeys also has declined when compared with the 5 year average (Figure 2). Overall, the data present a mixed picture, with more decreases than increases in MDR among the nine sources, but the magnitude of the increases being larger than the magnitude of the decreases.



Generally, some *Salmonella* serotypes (e.g. Typhimurium) are more likely to display MDR than others (e.g. Enteritidis) (Medalla, et al., 2013). However, increasing or decreasing trends in resistance are worth noting. MDR increased from 6% in 2007 to 27% in 2011 among serotype I 4,[5],12:i:- isolates from humans; a similar trend was observed among isolates from chickens at slaughter; from 7% in 2008 to 33% in 2011. Among serotype Heidelberg isolates from humans, MDR increased from 13% in 2006 to 34% in 2010, declining slightly to 30% in 2011. This increase was also observed among isolates from ground turkey and turkeys at slaughter; from 40% and 44% in 2006 to 93% and 60% in 2011, respectively.

MDR increased from 6% in 2007 to 27% in 2011 among serotype I 4,[5],12:i:- isolates from humans, and among serotype Heidelberg isolates, MDR increased from 13% in 2006 to 34% in 2010, declining slightly to 30% in 2011.

An important MDR pattern in *Salmonella* is the combined resistance to ampicillin, chloramphenicol, streptomycin, sulfisoxazole, and tetracycline (ACSSuT). This pattern, often indicative of a specific *Salmonella* Typhimurium designated DT104, has been tracked in NARMS for many years. NARMS observed a decline in ACSSuT resistance among human,

swine, and cattle isolates and continued resistance levels of less than 5% among isolates from retail poultry and poultry at slaughter. Specifically:

- the percentage of human isolates resistant to at least ACSSuT declined for the fourth year in a row to 4%, the lowest since testing began in 1996.
- 4% of isolates from swine at slaughter were resistant, a continued decline from the peak resistance of 13% in 2009.
- resistance in isolates from cattle was 13%, a slight decline from 2010 (19%).

NARMS observed a decline in ACSSuT resistance, among *Salmonella* isolates from humans, swine, and cattle and continued resistance levels of less than 5% among isolates from retail poultry and poultry at slaughter.

In some isolates, the ACSSuT pattern is linked with resistance to additional beta-lactam drugs, including ceftiofur, ceftriaxone, amoxicillin-clavulanic acid, and cefoxitin. Over the years, NARMS has detected this phenotype (abbreviated as MDR-AmpC or ACSSuTAuCx) among *Salmonella* from all types of sources tested. This highly resistant pattern typically indicates the presence of a particularly large multidrug resistance plasmid (Zhao et al., 2009, Sjölund-Karlsson et al.,2010, Glenn et al., 2013). ACSSuTAuCx resistance has remained below 5% among isolates from humans, retail poultry, poultry at slaughter, and swine since testing began. ACSSuTAuCx resistance is generally higher among cattle isolates at slaughter.

ACSSuTAuCx resistance has remained below 5% among isolates from humans, retail poultry, poultry at slaughter and swine since testing began. ACSSuTAuCx resistance is generally higher among cattle isolates from slaughter.

Campylobacter

CDC estimates that *Campylobacter* causes over 1.3 million illnesses and 120 deaths in the United States each year. Most people who become ill from *Campylobacter* get diarrhea, abdominal pain and fever. *Campylobacter jejuni* (or *C. jejuni*) and *Campylobacter coli* (*C. coli*) cause most campylobacteriosis. Many of these infections are foodborne, and poultry is a major source of human *C. jejuni* infections.

Number of Isolates Tested

A total of 2,634 *C. jejuni* and *C. coli* isolates were tested, including 1,423 from humans, 634 from retail poultry (603 from retail chicken and 31 from ground turkey), and 577 from chickens at slaughter. All sources except retail ground turkey yielded higher proportion of *C. jejuni* than *C. coli*.

No Resistance Detected

In 2011, 45% of *C. jejuni* and 36% of *C. coli* isolated from humans had no resistance to any of the antibiotic tested in NARMS. In retail and slaughtered chicken isolates, approximately 42-48% of *C. jejuni* and *C. coli* isolates had no resistance to any of the antibiotics tested. There are no clear upward or downward trends observed among the human and poultry isolates.

In 2011, 45% of *C. jejuni* and 36% of *C. coli* from human isolates had no resistance to any of the antibiotics tested in NARMS. There are no clear upward or downward trends observed among the human and poultry isolates.

Macrolides

The macrolide erythromycin is considered a drug of choice for the treatment of severe campylobacteriosis in humans (Allos and Blaser, 2010). Macrolides are also authorized for use in food-producing animals (Animal Drugs @ FDA). In 2011, NARMS observed a drop in erythromycin resistance among *C. coli* from human, retail chicken and slaughtered chicken to the lowest levels seen in several years (4%, 5%, and 3 %, respectively). Like other global surveillance programs, NARMS finds that *C. coli* isolates from human and chicken sources are more likely to be resistant to erythromycin than *C. jejuni*, which causes most campylobacteriosis. In the United States, *C. jejuni* from human and chicken sources has exhibited erythromycin resistance rates of less than 4% since NARMS testing began.

In 2011, erythromycin resistance in *C. Coli* from human, retail chicken and slaughtered chicken was at the lowest levels in several years (3%, 5%, and 3%, respectively). *C. jejuni* from humans and chicken sources has exhibited erythromycin resistance rate of less than 4% since NARMS testing began.

Quinolones

The fluoroquinolone ciprofloxacin is an alternative therapy for treating campylobacteriosis in humans (Allos and Blaser, 2010). FDA approvals of two veterinary fluoroquinolones, sarafloxacin and enrofloxacin, were withdrawn in April 2001 and September 2005, respectively, due to resistance concerns. See
http://www.fda.gov/AnimalVeterinary/SafetyHealth/RecallsWithdrawals/ucm042004.htm
Since 2005, NARMS has observed no consistent decreases in ciprofloxacin resistance among *C. jejuni* and *C. coli* isolates from humans or chicken sources. Many human cases of fluoroquinolone-resistant campylobacteriosis are linked to foreign travel (Kassenberg et al, 2004).

Since 2005, NARMS has observed no consistent decreases in ciprofloxacin resistance among *C. jejuni* and *C. coli* isolates from humans or chicken sources.

Aminoglycosides

Gentamicin is categorized as a highly important antibiotic for human medical therapy according to criteria outlined in FDA's guidance on evaluating the safety of new animal drugs (FDA, 2003). It is used in humans for the treatment of severe infections, including some *Campylobacter* infections (Allos and Blaser, 2010). Gentamicin is also used in food animals, including poultry, where it is approved for injection in day-old chicks and 1- to 3-day old turkey poults for the prevention of early mortality associated with bacterial infections (Animal Drugs @ FDA). Gentamicin is also approved as a dip for turkey eggs. Gentamicin resistance among *C. jejuni* isolates from humans, retail chicken meat and chickens at slaughter was less than 2% between 2007 and 2011. However, during that same period, gentamicin resistance among *C. coli* increased from 0% to 12% among isolates from humans, 1% to 18% among isolates from retail chicken meat, and 1% to 6% among isolates form chickens at slaughter. The cause of this surge in resistance is unknown.

Gentamicin resistance among *C. jejuni* isolates from humans, retail chicken meat and chickens at slaughter was less than 1% in 2011. However, between 2007 and 2011, gentamicin resistance among *C. coli* increased from 0% to 12% among isolates from humans, 1% to 18% among isolates from retail chicken meat and 1% to 6% among isolates from chickens at slaughter

Escherichia coli

In NARMS, generic *E. coli* are used as indicator organisms to detect both emerging resistance patterns and specific resistance genes that could potentially be transferred to other pathogenic gram negative bacteria (e.g. *Salmonella*). NARMS tests *E. coli* isolates for resistance to the same critically important antibiotics that are used in *Salmonella* testing. The NARMS Executive Report includes data on generic *E. coli* isolated from retail meat and slaughtered chickens only. NARMS does not conduct ongoing surveillance of resistance among generic *E. coli* isolated from healthy humans.

Number of Isolates Tested

In 2011, a total 1,684 *E. coli* were tested, consisting of 341 from retail chickens, 368 from ground turkey, 215 from ground beef, 146 from pork chops, and 614 from slaughtered chickens.

No Resistance Detected

Among isolates from retail meat and chickens at slaughter, ground beef and pork chops were more likely to have no resistance to any of the antibiotics tested (80% and 52%, respectively).

Poultry isolates were less likely to have no resistance (25% of isolates from retail chicken, 13% from ground turkey, and 21% from slaughtered chickens).

Quinolones

As with *Salmonella*, *E. coli* isolates from retail meat and slaughtered chickens have shown little resistance to ciprofloxacin (less than 1%). Additionally, nalidixic acid resistance has remained low; resistance among isolates from all animal sources was less than 3% in 2011.

Cephems

Ceftriaxone resistance among *E. coli* isolates from retail chicken increased from 8% in 2002 to 13% in 2011; ground turkey isolates showed a larger increase during the same time period (from 1% to 10%). This trend was similar in *Salmonella*. Resistance among isolates from slaughtered chicken also increased from 6% in 2000 to 12% in 2010 but dropped slightly to 9% in 2011. This was the first decline seen in the last 3 years. In 2011, ceftriaxone resistance among *E. coli* isolated from ground beef and pork chops was low (0.5% and 0%, respectively). Resistance from these sources has remained less than 7% since testing began.

Ceftriaxone resistance among *E. coli* isolates from retail chicken increased from 8% in 2002 to 13% in 2011; ground turkey isolates showed a larger increase during the same time period (from 1% to 10%). This trend was similar in *Salmonella*. Resistance among isolates from slaughtered chicken also increased from 6% in 2000 to 12% in 2010, but dropped slightly to 9% in 2011. This was the first decline seen in the last 3 years.

Resistance to Other beta-lactams

E. coli isolates were also screened for resistance to other drugs, including carbapenems. None of the *E. coli* isolates from retail meat or slaughtered chickens displayed phenotypes indicative of carbapenemase production.

Multidrug Resistance

Among *E. coli* isolates from retail poultry, NARMS observed a general increase in MDR among retail chicken (35% in 2002 to 38% in 2011) and ground turkey (53% to 64% during the same period), with some fluctuations. As with the *Salmonella* data, MDR among retail cattle (6%) and swine (9%) were at the lowest levels since testing began.

Summary

The NARMS program captures a wide spectrum of resistance findings. For some important drug/ organism/ source combinations, declining or low (or no) resistance was observed in 2011. For other combinations NARMS observed increases in resistance. All of these data are carefully

considered when evaluating and monitoring the safety of antibiotics used in the food-producing animals.

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III. Methods

A. Sampling Methodology

NARMS isolates originate from three distinct sources, which are described below.

1. Human Component

NARMS sampling of human enteric pathogens is based on the occurrence of laboratory-confirmed cases of infection. Participating public health laboratories serotype the isolates before shipping to CDC for susceptibility testing. From 1996 through 2002, participating sites submitted every 10th non-Typhi *Salmonella* isolate they received to CDC for antimicrobial susceptibility testing. From 2003 through 2007, sites submitted every 20th non-Typhi *Salmonella* isolate. Since 2008, they have submitted every 20th non-typhoidal *Salmonella* isolate.[1]

From 1997 through 2004, CDC received each week, the first *Campylobacter* isolate from each participating FoodNet laboratory. In 2005, a surveillance scheme for selecting a more representative sample of isolates was implemented. FoodNet sites changed to submitting every isolate (Georgia, Maryland, New Mexico, Oregon, and Tennessee), every other isolate (California, Colorado, Connecticut, and New York), or every fifth isolate (Minnesota) received. In 2010, the scheme for isolate submission was adjusted to every other isolate from Georgia and Maryland and every third from New Mexico.

2. Retail Meat Component

Each month, participating laboratories purchase approximately 40 meat samples, comprising 10 samples each of retail chicken[2], ground turkey, ground beef, and pork chops. Sites culture all meats for *Salmonella* and retail poultry for *Campylobacter*.[3] Since 2008, sites have tested for *Campylobacter* in retail poultry only. Four sites (Georgia, Oregon, Maryland and Tennessee) culture all meat samples for *E. coli* and *Enterococcus*.[4] Isolates are sent to CVM for species/serotype confirmation and antimicrobial susceptibility testing.

3. Animal Component

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

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

[1] *Salmonella* serotype Paratyphi B is included in the non-typhoidal *Salmonella* sampling scheme because available laboratory methods do not always allow for distinction between serotype Paratyphi B (which typically causes typhoidal illness) and serotype Paratyphi B var. L(+) tartrate+ (which typically causes non-typhoidal illness). Only serotype Paratyphi B isolates that have been determined to be tartrate positive (Paratyphi B var. L(+) tartrate+) are included with non-typhoidal *Salmonella* for reporting purposes.

[2] In 2011, 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 the inclusion of additional chicken parts as the source.

[3] Maryland did not participate in the retail meat sampling program in 2007, and Pennsylvania did not begin testing for *Campylobacter* until 2009. Before 2008, retail meat sites also tested ground beef and pork chop samples for *Campylobacter*.

[4] Maryland cultured retail meats for *E. coli* and *Enterococcus* from 2002 through 2006, and from 2010 through 2011.

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

In 1998, *Campylobacter* isolates from chickens were submitted to ARS from the Eastern FSIS laboratory, and in 1999 and 2000, *Campylobacter* isolates were obtained from all three FSIS laboratories (Eastern, Midwestern, and Western). FSIS cultured samples for *Campylobacter* using the most probable number method described in the FSIS Microbiology Laboratory Guidebook.[2] Nalidixic acid susceptibility and cephalothin resistance were initially used as identification criteria for *Campylobacter jejuni/coli*, which likely resulted in an underreporting of quinolone-resistant *Campylobacter*. A new ARS method was adopted in July of 2001, after which *Campylobacter* were isolated by ARS from chicken carcass rinsates submitted by the FSIS Eastern laboratory (which are representative of the entire U.S.). FSIS began testing for and isolating *Campylobacter* on young chicken and turkey carcasses through PR/HACCP verification sample sets, initiated on July 1, 2011. *Campylobacter* isolates were submitted to ARS for susceptibility testing. This Executive Report contains data on *Campylobacter* recovered from chicken carcass rinsates only from July 2001 through December 2011.

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

B. Antimicrobial Susceptibility Testing Methods

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

Antimicrobial minimal inhibitory concentrations (MICs) for *Salmonella* and *E. coli* were determined according to manufacturer instructions using the Sensititre® semi-automated antimicrobial susceptibility system (Trek Diagnostic Systems, Thermo Fisher Scientific Inc, Cleveland, Ohio). In 2011, *Salmonella* and *E. coli* were tested using a custom panel developed for Gram-negative bacteria, CMV2AGNF; which replaced CMV1AGNF. The new panel replaced amikacin with azithromycin. Data on amikacin susceptibility can be found in prior NARMS reports. In addition, *Salmonella* and *E. coli* that were resistant to ceftriaxone and/or ceftiofur were tested for resistance to other extended-spectrum beta-lactam agents using a custom plate (CMV2DW). The quality control organisms include *Escherichia coli* ATCC 25922, *Enterococcus faecalis* ATCC 29212, *Staphylococcus aureus* ATCC 29213, *Pseudomonas aeruginosa* ATCC 27853, and *Klebsiella pneumonia* ATCC 700603, according to Clinical and Laboratory Standards Institute (CLSI) recommendations.[3,4]

Methods used to determine MICs for *Campylobacter* have also changed over time. Through 2004, the human and animal components of NARMS used Etest® (AB Biodisk, Solna, Sweden). The antimicrobial

[1] http://www.fsis.usda.gov/wps/portal/fsis/topics/data-collection-and-reports/microbiology/serotyping-of-salmonellae-from-meat-and-poultry-products_-quarterly-reports/q-3-4-2006/CT_Index
[2] http://www.fsis.usda.gov/wps/portal/fsis/topics/science/laboratories-and-procedures/guidebooks-and-methods/microbiology-laboratory-guidebook/microbiology-laboratory-guidebook
[3] CLSI. 2008. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Third Edition. CLSI document M31-A3. CLSI, Wayne, PA.
[4] CLSI. 2012. Performance Standards for Antimicrobial Susceptibility Testing; Twenty-second Informational Supplement. CLSI document M100-S22. CLSI, Wayne, PA.

agents tested using Etest® included: azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, gentamicin, nalidixic acid, and tetracycline. Based on Etest® manufacturer recommendations, MIC results that fell between the two-fold dilutions described in CLSI documents were rounded up to the next two-fold dilution for interpretation.[1] The retail component of NARMS used the agar dilution method in 2002 and 2003. The antimicrobial agents tested using agar dilution included ciprofloxacin, doxycycline, erythromycin, gentamicin, and meropenem. Recognizing the need for a standardized semi-automated method, CVM developed a broth microdilution method which was approved and published by CLSI in 2006.[2] The retail meat component began using this method in 2004 and the human and food animal components adopted the method in 2005. Testing was done using the Sensititre® semiautomated antimicrobial susceptibility system (Trek Diagnostic Systems, Thermo Fisher Scientific Inc, Cleveland, Ohio) and a custom panel developed for *Campylobacter* (Trek catalog # CAMPY). The antimicrobial agents included in broth microdilution testing were azithromycin, ciprofloxacin, clindamycin, erythromycin, florfenicol, gentamicin, nalidixic acid, telithromycin, and tetracycline. *Campylobacter jejuni* ATCC 33560 was used as the quality control organism.

C. Breakpoints

The breakpoints used in this report are shown in Tables 1-3. CLSI-approved breakpoints were used when available and were adopted from CLSI documents M45-A2, M31-A3, and M100-S22.[3,4,5] For *Salmonella* and *E. coli*, CLSI breakpoints were available for all antimicrobial agents tested except streptomycin and azithromycin. For *Campylobacter*, CLSI breakpoints were available only for ciprofloxacin, doxycycline, erythromycin, and tetracycline.[3] NARMS breakpoints were used when CLSI breakpoints were not available. NARMS breakpoints were established based on the MIC distributions of NARMS isolates and the presence of known resistance genes or mutations. CLSI updated breakpoints for ciprofloxacin for invasive *Salmonella* serotypes in its M100-S22 document published in January 2012.[3] The new breakpoints for ciprofloxacin were applied to all *Salmonella* in all 2011 NARMS reports and will be applied to generic *E. coli* in the 2012 NARMS reports. The new breakpoint for invasive *Salmonella* that defines resistance to ciprofloxacin is ≥1 µg/ml, and the susceptible range is defined as ≤0.06 µg/ml. Isolates with an MIC of 0.12-0.5 µg/ml are defined as intermediate. The impact of the breakpoint changes on NARMS 2011 *E. coli* data is shown in Appendix C.

[1] In USDA's NARMS annual reports, MIC values were not rounded up prior to interpretation.
[2] CLSI. 2006. Methods for Antimicrobial Dilution and Disk Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria; Approved Guideline. CLSI document M45-A. CLSI, Wayne, PA.
[3] CLSI. 2010. Methods for Antimicrobial Dilution and Disk Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria; Approved Guideline- Second Edition. CLSI document M45-A2. CLSI, Wayne, PA.
[4] CLSI. 2008. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Third Edition. CLSI document M31-A3. CLSI, Wayne, PA.
[5] CLSI. 2012. Performance Standards for Antimicrobial Susceptibility Testing; Twenty-second Informational Supplement. CLSI document M100-S22. CLSI, Wayne, PA.

C. Breakpoints

Table 1. Interpretive Criteria Used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli* [1]

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

[1] Breakpoints adopted from CLSI, except for azithromycin and streptomycin, which have no CLSI breakpoints. The breakpoints for azithromycin and streptomycin are NARMS-established breakpoints developed for resistance monitoring. They should not be used to preditct clinical efficacy.

[2] Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

[3] In this NARMS report, the revised ciprofloxacin breakpoint for invasive *Salmonella* from the CLSI M100-S22 document, published in January 2012, was used. The revised breakpoints were applied to all non-typhoidal *Salmonella.* In previous NARMS reports, breakpoints from the CLSI M100-S21 were used.

Table 2. Interpretive Criteria Used for Antimicrobial Susceptibility Testing of *Campylobacter* [1]

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

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

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

Table 3. Interpretive Criteria Used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-Tazobactam	≤ 16	32 - 64	≥ 128
Cephems	Cefepime	≤ 8	16	≥ 32
	Cefotaxime	≤ 1	2	≥ 4
	Ceftazidime	≤ 4	8	≥ 16
Monobactams	Aztreonam	≤ 4	8	≥ 16
Penems	Imipenem	≤ 1	2	≥ 4

D. Reporting Methods

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

Section IV of the report contains data for non-typhoidal *Salmonella enterica* isolates recovered from humans, retail meats, and food animals at slaughter. In reports before 2007, *Salmonella enterica* serotypes Paratyphi A, Paratyphi B (tartrate-negative), and Paratyphi C, which cause enteric fever in humans but are not associated with food animal reservoirs, were reported with other non-typhoidal serotypes. Data for typhoidal *Salmonella* can be found in the NARMS Human Isolates Final Report published by CDC.

Antimicrobial susceptibility data are first presented for all non-typhoidal *Salmonella enterica* serotypes. Data are then presented for the following top non-typhoidal *Salmonella enterica* serotypes in humans: Enteritidis, Typhimurium, Newport, I 4,[5],12:i:- and Heidelberg. During 2011, Javiana was the fourth most common non-typhoidal *Salmonella* serotype in humans. However, data for Salmonella ser. Javiana are not presented separately in this report because no isolates were recovered from retail meats, and only three isolates were recovered from food animals. *Salmonella* serotype I 4,[5]12:i:- includes *Salmonella enterica* strains with the antigenic formulas I 4,12:i:- and I 4,5,12:i:-. Food animal data for *Salmonella enterica* serotype I 4,[5],12:i:- are not available before 2004 because NVSL, which serotyped the *Salmonella* isolates, did not report antigenic formulas for most monophasic *Salmonella enterica* serotypes at that time.

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

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

Data on antimicrobial susceptibility testing follows. MIC tables are presented for non-typhoidal *Salmonella*, *C. jejuni*, *C. coli*, and *E. coli* isolates. There is also an MIC table for *Salmonella* and *E. coli* isolates that were resistant to ceftiofur or ceftriaxone and tested for susceptibility to other extended-spectrum beta-lactam agents. The tables include MIC distributions, percentages of isolates displaying intermediate susceptibility and resistance, and 95% confidence intervals for the percent resistant, by source for 2011. Confidence intervals were calculated using the Clopper-Pearson exact method.[1] The unshaded areas in the MIC tables indicate the range of concentrations tested for each antimicrobial agent.[2] Single vertical bars indicate breakpoints for susceptibility, while double vertical bars indicate breakpoints for resistance.

The MIC distributions are followed by tables that show the numbers and percentages of isolates that were resistant, by year, from 2000 through 2011.[3] Due to space constraints, data from 1996 through 1999 are not shown in the resistance tables, but they can be found in reports prior to 2008.[4,5] The total number of isolates tested per year for each source is listed at the top of each table. An empty cell in this area indicates that surveillance was not conducted for that particular source, whereas a zero indicates that surveillance was conducted, but no isolates were available for testing. Below the section containing the number of isolates

[1] Newcombe RG. Two-sided confidence intervals for the single proportion: comparison of seven methods. Statistics in Medicine 1998; 17(8): 857-872.
[2] The concentration ranges are also listed in Appendix A.
[3] Data on *Campylobacter* recovered from chickens is presented only for the period of July 2001 through December 2010 as described in Section IIA.
[4] FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2007 Executive Report. Rockville, MD: U.S. Department of Health and Human Services, Food and Drug Administration, 2010.
[5] Data from 1996 through 1999 are still included in the graphs and supporting tables.

tested, empty shaded boxes indicate that there are no data to report, because surveillance was not conducted or isolates were not available for testing. Similar tables are presented for *Salmonella* serotypes Enteritidis, Typhimurium, Newport, I 4,[5],12;i:- and Heidelberg.

Third-generation cephalosporins (such as ceftriaxone) and fluoroquinolones (such as ciprofloxacin) are antimicrobial agents commonly used for the treatment of severe *Salmonella* infections in humans. Resistance to ceftriaxone and nalidixic acid in *Salmonella* is highlighted in several pie charts and graphs (Figures 6-10).[1,2] Prior to 2008, NARMS reports highlighted resistance to ceftiofur (an extended-spectrum cephalosporin used in food animals), which is usually indicative of the presence of an AmpC beta-lactamase gene (bla_{CMY-27}), to represent resistance to third-generation cephalosporins. Since CLSI published lower MIC criteria for ceftriaxone resistance in 2010, the frequency of ceftriaxone resistance (MIC ≥ 4 µg/ml) is now nearly identical to the frequency of ceftiofur resistance.[3] Resistance to the quinolone nalidixic acid (MIC ≥ 32 µg/ml) indicates certain chromosomal point mutations that also cause decreased susceptibility to ciprofloxacin (MIC ≥ 0.125 µg/ml), which is associated with greater risk of treatment failure.[4]

The NARMS Executive Report also highlights, through a series of graphs, resistance to quinolones and macrolides, two antimicrobial classes important for treating *Campylobacter* infections in humans. Quinolones such as the fluoroquinolone, ciprofloxacin are effective treatments for human campylobacteriosis. Fluoroquinolones were first approved for use in poultry in the United States in 1995 for control of mortality associated with *E. coli*. Because of concerns about increasing fluoroquinolone resistance among *Campylobacter* in both animal and human hosts, approvals for sarafloxacin and enrofloxacin use in poultry were withdrawn in April 2001 and September 2005, respectively. NARMS continues to monitor the susceptibility of *Campylobacter* to fluoroquinolones.

Finally, multidrug resistance data for all three genera are presented (Tables 14-26, 30, 33, 36, 39, 42, 53, and 58). Data for specific multidrug resistance phenotypes of public health importance are reported along with data on resistance to CLSI antimicrobial classes. Tables 14-18 show the number of resistant *Salmonella* isolates by antimicrobial agent and the number of antimicrobial classes in a resistance pattern for each of the top serotypes (comprising at least 2% of isolates) from each source. For *Salmonella* and *E. coli*, resistance to multiple antimicrobial classes includes nine CLSI antimicrobial classes represented by 15 agents: amoxicillin-clavulanic acid, ampicillin, azithromycin, cefoxitin, ceftiofur, ceftriaxone, chloramphenicol, ciprofloxacin, gentamicin, kanamycin, nalidixic acid, streptomycin, sulfamethoxazole/sulfisoxazole, tetracycline, and trimethoprim-sulfamethoxazole. Testing of azithromycin, which represents the macrolide class, began in 2011.[5] Cefoxitin was not tested prior to 2000. Multidrug resistance data for *Campylobacter* are also in the 2011 report. All seven antimicrobial classes and all nine antimicrobial agents included in broth microdilution testing of *Campylobacter* isolates are represented in Table 53.

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

[1] Note that the scales vary from figure to figure, based on the maximum percent resistance.
[2] Below each graph is a table that shows the number of isolates tested. Empty grey boxes indicate that surveillance was not conducted, while boxes with zeros indicate that there were no isolates available for testing.
[3] CLSI. 2010. Performance Standards for Antimicrobial Susceptibility Testing; Twentieth Informational Supplement. CLSI document M100-S20. CLSI, Wayne, PA.
[4] Crump JA, Barrett TJ, Nelson JT, Angulo FJ. Reevaluating fluoroquinolone breakpoints for *Salmonella enterica* serotype Typhi and for Non-Typhi salmonellae. Clin Inf Dis 2003;37:75-81.
[5] In previous NARMS reports, amikacin was included in the analysis of antimicrobial class resistance. Because resistance to azithromycin and to amikacin is low (<1%), the data in the 2011 reports are comparable to the data in previous reports.

IV. Non-Typhoidal *Salmonella* Data

A. Non-Typhoidal *Salmonella* Isolates Tested

Table 4. Number of Non-Typhoidal *Salmonella* Isolates Tested, by Source and Year, 1996-2011[1]

	Year															
Source	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
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 Chops							10	5	11	9	8	18	23	8	20	28
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121	151	103
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200	247	340
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120	111	90

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

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

Table 5. Number and Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2011

	Retail Chicken	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1320	1320	1320	1320
Number Positive for *Salmonella*	158	162	9	28
Percent Positive for *Salmonella*	12.0%	12.3%	0.7%	2.1%

Figure 1. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2011

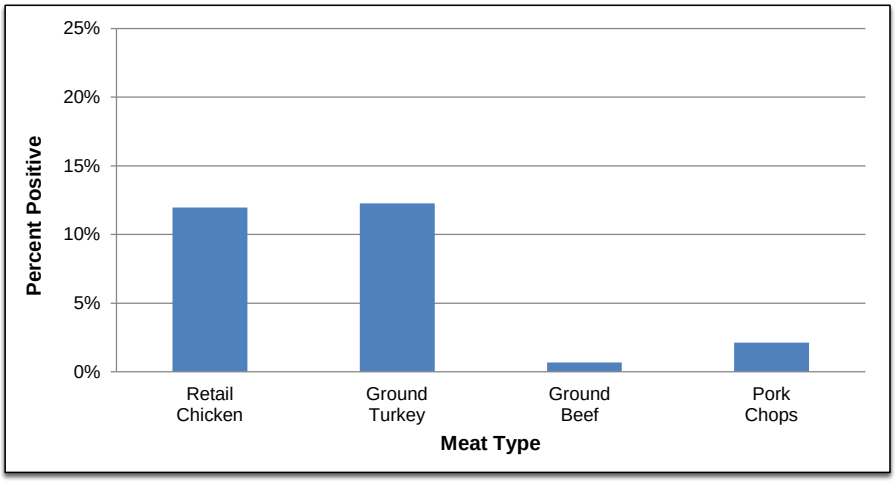
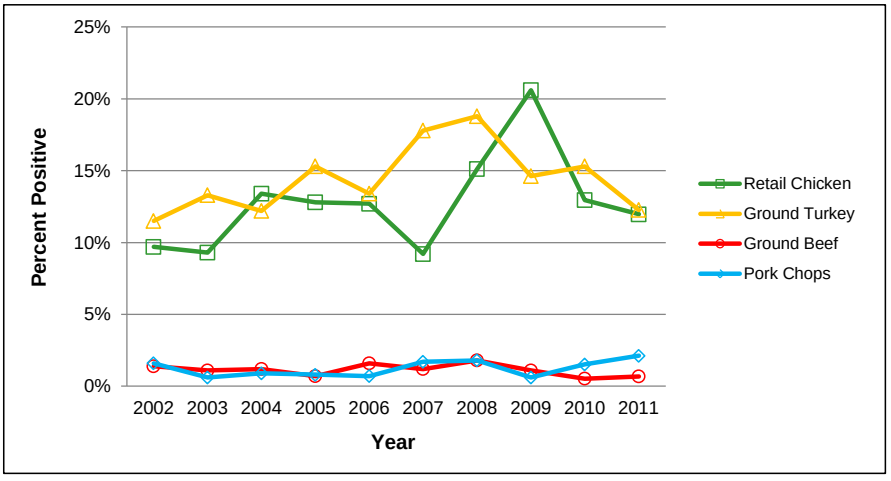


Figure 2. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2002-2011



C. Non-Typhoidal *Salmonella* Serotypes

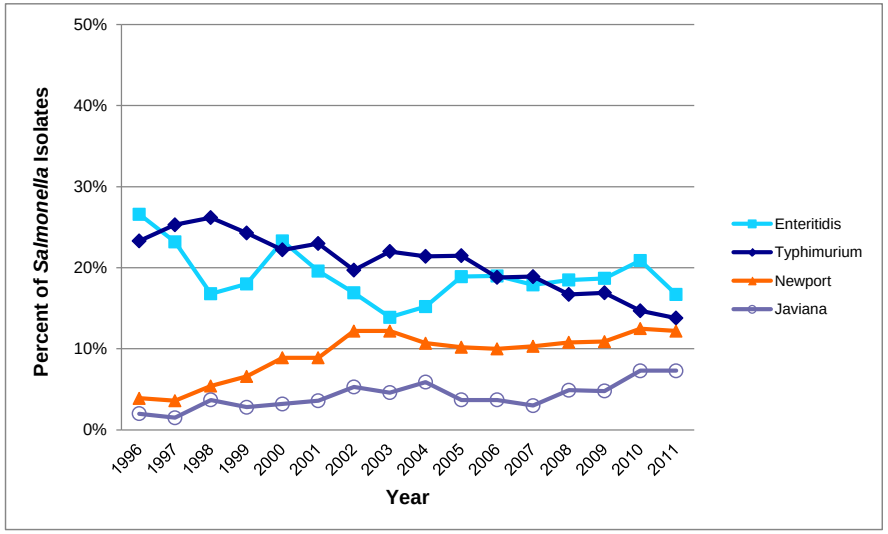
Table 6. Most Common Serotypes among Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=2344)	Enteritidis	391	16.7	**Retail Chicken (N=158)**	Typhimurium	66	41.8	**Chickens (N=491)**	Kentucky	227	46.2
	Typhimurium	323	13.8		Kentucky	45	28.5		Enteritidis	134	27.3
	Newport	285	12.2		Enteritidis	21	13.3		Typhimurium	30	6.1
	Javiana	170	7.3		Heidelberg	11	7.0		Heidelberg	28	5.7
	I 4,[5],12:i:-	82	3.5		Infantis	4	2.5		Infantis	16	3.3
	Heidelberg	70	3.0		Mbandaka	3	1.9		Braenderup	7	1.4
	Montevideo	65	2.8		Other	8	5.1		Mbandaka	7	1.4
	Infantis	63	2.7						I 4,[5],12:i:-	6	1.2
	Muenchen	49	2.1						Johannesburg	6	1.2
	Braenderup	48	2.0						I 8,20:-:z6	5	1.0
	Oranienburg	48	2.0						Other	25	5.1
	Paratyphi B var. L(+) tartrate+	42	1.8								
	Saintpaul	36	1.5								
	Agona	30	1.3								
	Poona	25	1.1	**Ground Turkey (N=162)**	Saintpaul	35	21.6	**Turkeys (N=103)**	Hadar	20	19.4
	Mississippi	22	0.9		Heidelberg	28	17.3		IIIa 18:z4,z23:-	13	12.6
	Rubislaw	22	0.9		Hadar	23	14.2		Schwarzengrund	10	9.7
	Thompson	22	0.9		IIIa 18:z4,z23:-	14	8.6		Muenchen	9	8.7
	Berta	21	0.9		Schwarzengrund	9	5.6		Saintpaul	6	5.8
	Bareilly	20	0.9		Senftenberg	9	5.6		Berta	5	4.9
	Unknown serotype	54	2.3		Agona	8	4.9		Heidelberg	5	4.9
	Partially serotyped	24	1.0		Typhimurium	8	4.9		Albany	4	3.9
	Rough/Nonmotile isolates	21	0.9		Berta	3	1.9		Newport	4	3.9
	Other	411	17.5		Muenchen	3	1.9		Reading	4	3.9
					Thompson	3	1.9		Agona	3	2.9
					I 4,12:d:-	2	1.2		Other	20	19.4
					Derby	2	1.2				
					Kentucky	2	1.2				
					Muenster	2	1.2				
					Tennessee	2	1.2				
					Other	9	5.6				
				Ground Beef (N=9)	Infantis	3	33.3	**Cattle (N=340)**	Montevideo	99	29.1
					Kentucky	3	33.3		Dublin	38	11.2
					Litchfield	1	11.1		Muenster	24	7.1
					Mbandaka	1	11.1		Kentucky	18	5.3
					Montevideo	1	11.1		Anatum	17	5.0
									Infantis	15	4.4
									Cerro	14	4.1
									Meleagridis	14	4.1
									Typhimurium	14	4.1
									Newport	13	3.8
									Mbandaka	7	2.1
									Other	67	19.7
				Pork Chops (N=28)	Hadar	8	28.6	**Swine (N=90)**	Adelaide	13	14.4
					Typhimurium	7	25.0		Johannesburg	12	13.3
					Ohio	3	10.7		Derby	10	11.1
					Derby	2	7.1		Infantis	10	11.1
					Agona	1	3.6		Anatum	8	8.9
					Berta	1	3.6		Agona	5	5.6
					Heidelberg	1	3.6		Typhimurium	5	5.6
					Hindmarsh	1	3.6		Uganda	5	5.6
					Infantis	1	3.6		Ohio	4	4.4
					Saintpaul	1	3.6		I 4,[5],12:i:-	2	2.2
					Uganda	1	3.6		Muenchen	2	2.2
					Worthington	1	3.6		Other	14	15.6

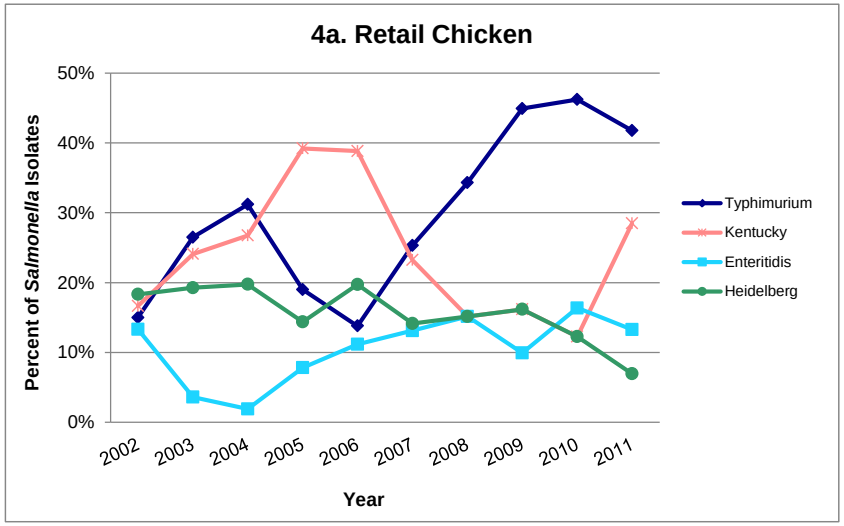
Table 7. Most Common Non-Typhoidal *Salmonella* Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, by Meat Type and Animal Source, 2011

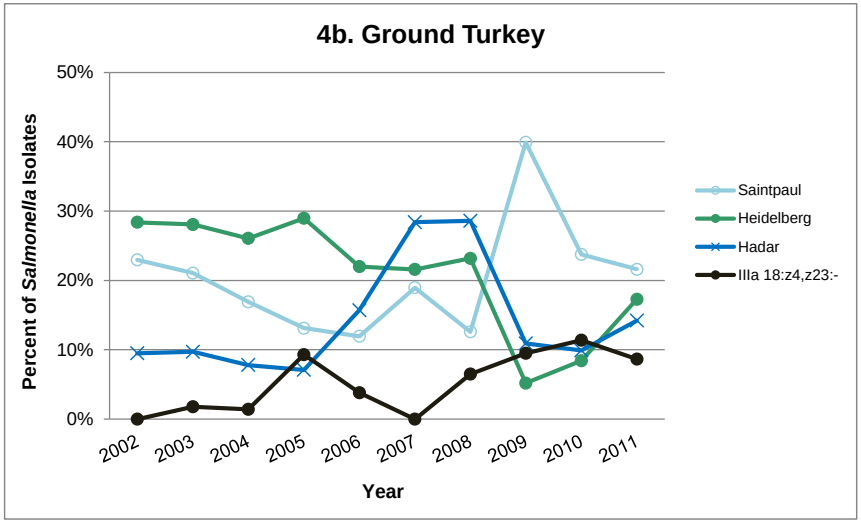
	Humans	Retail Meats				Food Animals			
	Humans (N=2344)	Retail Chicken (N=158)	Ground Turkey (N=162)	Ground Beef (N=9)	Pork Chops (N=28)	Chickens (N=491)	Turkeys (N=103)	Cattle (N=340)	Swine (N=90)
1. Enteritidis	16.7% 391	13.3% 21	0.6% 1	0.0% 0	0.0% 0	27.3% 134	0.0% 0	0.0% 0	0.0% 0
2. Typhimurium	13.8% 323	41.8% 66	4.9% 8	0.0% 0	25.0% 7	6.1% 30	1.9% 2	4.1% 14	5.6% 5
3. Newport	12.2% 285	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1	3.9% 4	3.8% 13	1.1% 1
4. Javiana	7.3% 170	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.6% 2	0.0% 0
5. I 4,[5],12:i:-	3.5% 82	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.2% 6	1.0% 1	0.6% 2	2.2% 2
6. Heidelberg	3.0% 70	7.0% 11	17.3% 28	0.0% 0	3.6% 1	5.7% 28	4.9% 5	0.0% 0	0.0% 0
7. Montevideo	2.8% 65	0.6% 1	0.6% 1	11.1% 1	0.0% 0	0.2% 1	1.9% 2	29.1% 99	0.0% 0
8. Infantis	2.7% 63	2.5% 4	0.6% 1	33.3% 3	3.6% 1	3.3% 16	0.0% 0	4.4% 15	11.1% 10
9. Muenchen	2.1% 49	0.0% 0	1.9% 3	0.0% 0	0.0% 0	0.0% 0	8.7% 9	1.2% 4	2.2% 2
10. Braenderup	2.0% 48	0.6% 1	0.0% 0	0.0% 0	0.0% 0	1.4% 7	0.0% 0	0.9% 3	0.0% 0
11. Oranienburg	2.0% 48	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0

Figure 3. Most Common Non-Typhoidal *Salmonella* Serotypes from Humans in 2011 and their Relative Frequencies, by Year, 1996-2011

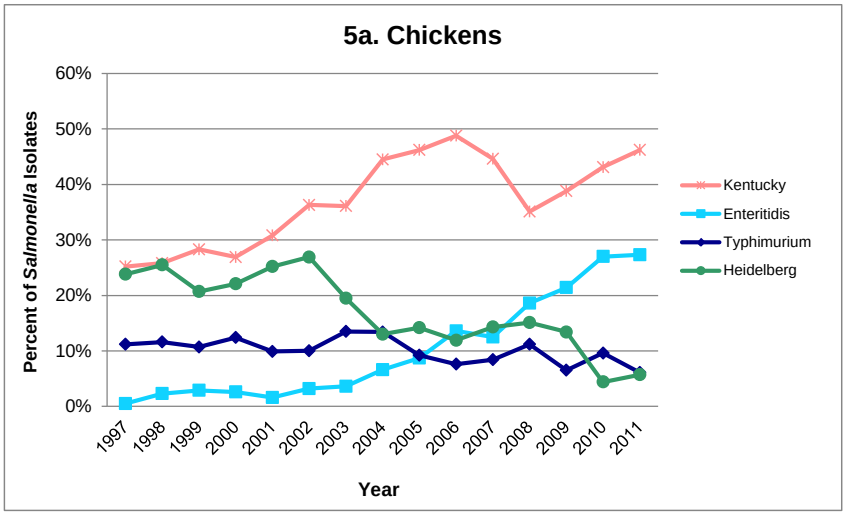


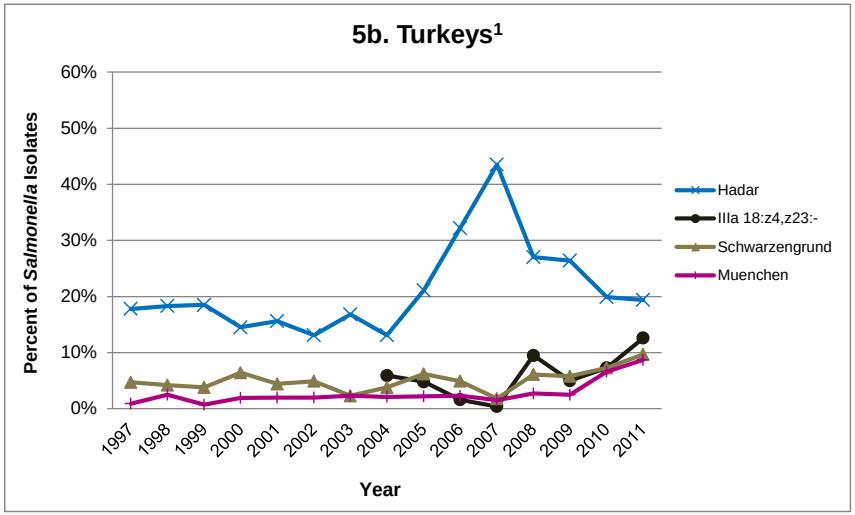
Figures 4a-b. Most Common Non-Typhoidal *Salmonella* Serotypes from Retail Poultry in 2011 and their Relative Frequencies, by Year, 2002-2011



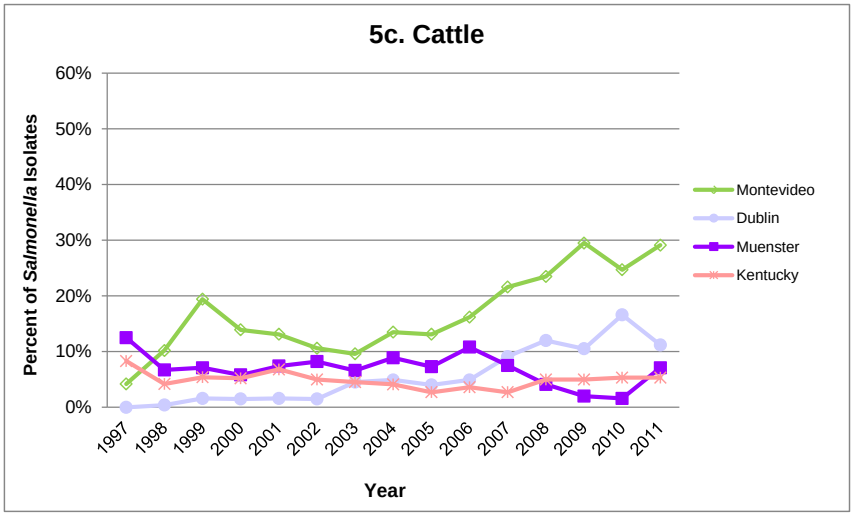


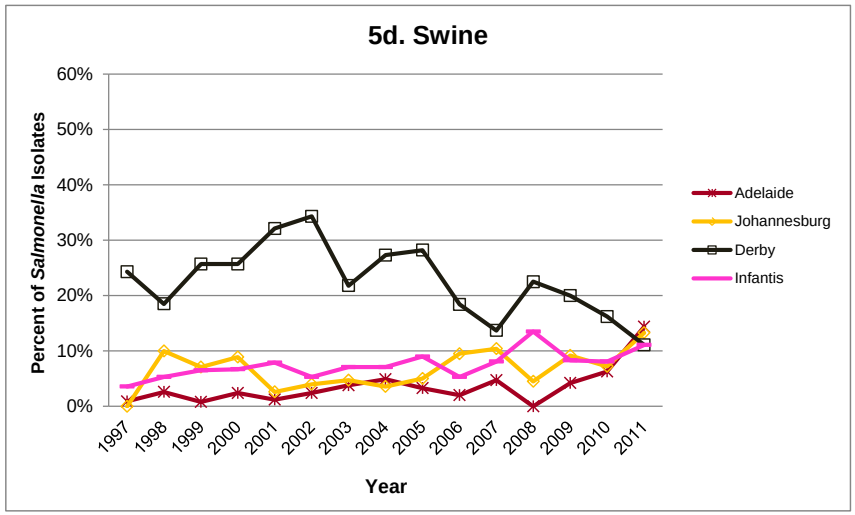
Figures 5a-d. Most Common Non-Typhoidal *Salmonella* Serotypes from Food Animals in 2011 and their Relative Frequencies, by Year, 1997-2011





[1] IIIa 18:z4,z23:- was not reported prior to 2004





D. Antimicrobial Susceptibility among all Non-Typhoidal *Salmonella*

MIC Distributions

Table 8a. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 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
Aminoglycosides																					
Gentamicin	Humans (2344)	<0.1	**1.7**	[1.2 - 2.3]					8.3	76.4	13.1	0.5		<0.1	**0.2**	**1.5**					
	Retail Chicken (158)	1.3	**3.8**	[1.4 - 8.1]					25.3	64.6	4.4	0.6		1.3	**0.6**	**3.2**					
	Ground Turkey (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**					
	Ground Beef (9)	0.0	**0.0**	[0.0 - 33.6]						77.8	22.2										
	Pork Chops (28)	0.0	**3.6**	[0.1 - 18.3]					10.7	71.4	14.3					**3.6**					
	Chickens (491)	0.4	**3.5**	[2.0 - 5.5]					60.5	34.4	1.2			0.4	**1.4**	**2.0**					
	Turkeys (103)	1.9	**14.6**	[8.4 - 22.9]					44.7	35.9	1.9	1.0		1.9	**4.9**	**9.7**					
	Cattle (340)	0.3	**2.1**	[0.8 - 4.2]					37.1	56.2	3.8	0.3	0.3	0.3		**2.1**					
	Swine (90)	0.0	**0.0**	[0.0 - 4.0]					78.9	21.1											
Kanamycin	Humans (2344)	<0.1	**1.7**	[1.2 - 2.3]										98.2	0.1	<0.1	**<0.1**	**1.6**			
	Retail Chicken (158)	0.0	**11.4**	[6.9 - 17.4]										88.6				**11.4**			
	Ground Turkey (162)	0.6	**14.8**	[9.7 - 21.2]										80.9	3.7	0.6	**1.2**	**13.6**			
	Ground Beef (9)	0.0	**11.1**	[0.3 - 48.2]										88.9				**11.1**			
	Pork Chops (28)	0.0	**7.1**	[0.9 - 23.5]										92.9				**7.1**			
	Chickens (491)	0.4	**0.6**	[0.1 - 1.8]										98.6	0.4	0.4		**0.6**			
	Turkeys (103)	1.9	**8.7**	[4.1 - 15.9]										89.3		1.9	**1.9**	**6.8**			
	Cattle (340)	0.0	**6.2**	[3.9 - 9.3]										93.2	0.6		**0.6**	**5.6**			
	Swine (90)	0.0	**3.3**	[0.7 - 9.4]										96.7				**3.3**			
Streptomycin	Humans (2344)	N/A	**9.8**	[8.6 - 11.1]												90.2	**2.3**	**7.5**			
	Retail Chicken (158)	N/A	**38.6**	[31.0 - 46.7]												61.4	**17.1**	**21.5**			
	Ground Turkey (162)	N/A	**56.2**	[48.2 - 63.9]												43.8	**25.9**	**30.3**			
	Ground Beef (9)	N/A	**33.3**	[7.5 - 70.1]												66.7	**22.2**	**11.1**			
	Pork Chops (28)	N/A	**57.1**	[37.2 - 75.5]												42.9	**17.9**	**39.3**			
	Chickens (491)	N/A	**35.8**	[31.6 - 40.3]												64.2	**27.9**	**7.9**			
	Turkeys (103)	N/A	**22.3**	[14.7 - 31.6]												77.7	**14.6**	**7.8**			
	Cattle (340)	N/A	**19.4**	[15.3 - 24.0]												80.6	**2.1**	**17.4**			
	Swine (90)	N/A	**18.9**	[11.4 - 28.5]												81.1	**6.7**	**12.2**			
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (2344)	2.0	**2.6**	[2.0 - 3.3]							89.2	1.7	0.6	3.9	2.0	**0.8**	**1.8**				
	Retail Chicken (158)	3.2	**33.5**	[26.2 - 41.5]							55.7	2.5	1.3	3.8	3.2	**11.4**	**22.2**				
	Ground Turkey (162)	12.3	**21.0**	[15.0 - 28.1]							38.9	2.5	1.9	23.5	12.3	**8.0**	**13.0**				
	Ground Beef (9)	0.0	**11.1**	[0.3 - 48.2]							88.9					**11.1**					
	Pork Chops (28)	28.6	**3.6**	[0.1 - 18.3]							39.3	14.3		14.3	28.6		**3.6**				
	Chickens (491)	0.2	**6.3**	[4.3 - 8.8]							90.2	2.9		0.4	0.2	**1.8**	**4.5**				
	Turkeys (103)	6.8	**11.7**	[6.2 - 19.5]							72.8		1.0	7.8	6.8	**3.9**	**7.8**				
	Cattle (340)	1.2	**14.7**	[11.1 - 18.9]							80.0	2.1	1.5	0.6	1.2	**3.8**	**10.9**				
	Swine (90)	1.1	**2.2**	[0.3 - 7.8]							88.9		5.6	2.2	1.1	**1.1**	**1.1**				

[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 the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 8b. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 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	0.5	1	2	4	8	16	32	64	128	256	512	1024
Cephems																					
Cefoxitin	Humans (2344)	0.2	**2.6**	[2.0 - 3.3]						0.4	31.1	53.7	10.7	1.3	0.2	**1.1**	**1.5**				
	Retail Chicken (158)	8.9	**25.9**	[19.3 - 33.5]							0.6	43.0	20.3	1.3	8.9	**17.1**	**8.9**				
	Ground Turkey (162)	3.7	**17.9**	[12.3 - 24.7]							2.5	53.1	19.8	3.1	3.7	**4.3**	**13.6**				
	Ground Beef (9)	11.1	**0.0**	[0.0 - 33.6]							11.1	33.3	44.4		11.1						
	Pork Chops (28)	3.6	**10.7**	[2.3 - 28.2]							3.6	53.6	28.6		3.6	**7.1**	**3.6**				
	Chickens (491)	0.2	**6.5**	[4.5 - 9.1]						0.2	17.7	61.1	13.6	0.6	0.2	**5.5**	**1.0**				
	Turkeys (103)	0.0	**11.7**	[6.2 - 19.5]							8.7	58.3	18.4	2.9		**2.9**	**8.7**				
	Cattle (340)	1.2	**13.8**	[10.3 - 18.0]							7.4	39.4	35.3	2.9	1.2	**5.0**	**8.8**				
	Swine (90)	0.0	**2.2**	[0.3 - 7.8]							1.1	35.6	56.7	4.4			**2.2**				
Ceftiofur	Humans (2344)	<0.1	**2.5**	[1.9 - 3.2]				0.3	0.8	37.7	57.7	1.0	<0.1	**0.2**	**2.3**						
	Retail Chicken (158)	0.0	**34.2**	[26.8 - 42.1]						19.6	43.0	3.2		**10.1**	**24.1**						
	Ground Turkey (162)	0.6	**20.4**	[14.5 - 27.4]						16.1	59.3	3.7	0.6	**3.1**	**17.3**						
	Ground Beef (9)	0.0	**11.1**	[0.3 - 48.2]						33.3	55.6			**11.1**							
	Pork Chops (28)	0.0	**7.1**	[0.9 - 23.5]						10.7	67.9	14.3		**3.6**	**3.6**						
	Chickens (491)	0.4	**6.1**	[4.2 - 8.6]				0.4	1.0	43.0	47.9	1.2	0.4		**6.1**						
	Turkeys (103)	0.0	**11.7**	[6.2 - 19.5]						44.7	42.7	1.0			**11.7**						
	Cattle (340)	1.8	**13.2**	[9.8 - 17.3]					0.6	34.7	48.8	0.9	1.8	**1.5**	**11.8**						
	Swine (90)	0.0	**2.2**	[0.3 - 7.8]						30.0	66.7	1.1			**2.2**						
Ceftriaxone	Humans (2344)	<0.1	**2.5**	[1.9 - 3.2]					97.5			<0.1	**0.1**	**0.3**	**1.0**	**0.8**	**0.3**	**0.1**			
	Retail Chicken (158)	1.3	**33.5**	[26.2 - 41.5]					65.2			1.3	**0.6**	**13.9**	**12.7**	**4.4**	**1.9**				
	Ground Turkey (162)	0.0	**22.2**	[16.1 - 29.4]					75.9	1.9			**1.2**	**4.9**	**6.8**	**6.2**	**3.1**				
	Ground Beef (9)	0.0	**11.1**	[0.3 - 48.2]					88.9					**11.1**							
	Pork Chops (28)	3.6	**7.1**	[0.9 - 23.5]					89.3			3.6		**3.6**		**3.6**					
	Chickens (491)	0.0	**6.3**	[4.3 - 8.8]					93.1	0.6			**0.2**	**0.6**	**4.9**	**0.2**	**0.4**				
	Turkeys (103)	0.0	**11.7**	[6.2 - 19.5]					88.3					**1.0**	**2.9**	**3.9**	**3.9**				
	Cattle (340)	0.3	**14.4**	[10.9 - 18.6]					85.0	0.3		0.3	**1.2**	**2.6**	**4.7**	**5.0**	**0.6**	**0.3**			
	Swine (90)	0.0	**2.2**	[0.3 - 7.8]					97.8						**1.1**	**1.1**					
Folate Pathway Inhibitors																					
Sulfisoxazole	Humans (2344)	N/A	**8.6**	[7.5 - 9.8]											5.9	46.1	37.8	1.5		**8.6**	
	Retail Chicken (158)	N/A	**44.9**	[37.0 - 53.0]											16.5	17.7	20.3	0.6		**44.9**	
	Ground Turkey (162)	N/A	**26.5**	[19.9 - 34.0]											13.0	32.1	27.8	0.6		**26.5**	
	Ground Beef (9)	N/A	**0.0**	[0.0 - 33.6]											22.2	55.6	11.1	11.1			
	Pork Chops (28)	N/A	**25.0**	[10.7 - 44.9]											42.9	10.7	17.9	3.6		**25.0**	
	Chickens (491)	N/A	**7.9**	[5.7 - 10.7]											12.8	58.7	20.2	0.4		**7.9**	
	Turkeys (103)	N/A	**22.3**	[14.7 - 31.6]											21.4	46.6	9.7			**22.3**	
	Cattle (340)	N/A	**20.0**	[15.9 - 24.7]											11.8	46.8	20.3	0.9	0.3	**20.0**	
	Swine (90)	N/A	**17.8**	[10.5 - 27.3]											36.7	28.9	14.4	2.2		**17.8**	

[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 8c. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 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
Folate Pathway Inhibitors																					
Trimethoprim-Sulfamethoxazole	Humans (2344)	N/A	**1.2**	[0.8 - 1.7]				96.8	1.7	0.2		<0.1	**<0.1**	**1.2**							
	Retail Chicken (158)	N/A	**1.3**	[0.2 - 4.5]				95.6	2.5	0.6				**1.3**							
	Ground Turkey (162)	N/A	**3.7**	[1.4 - 7.9]				93.8	2.5					**3.7**							
	Ground Beef (9)	N/A	**0.0**	[0.0 - 33.6]				100.0													
	Pork Chops (28)	N/A	**0.0**	[0.0 - 12.3]				92.9	7.1												
	Chickens (491)	N/A	**0.2**	[0.0 - 1.1]				99.6	0.2					**0.2**							
	Turkeys (103)	N/A	**0.0**	[0.0 - 3.5]				99.0	1.0												
	Cattle (340)	N/A	**1.8**	[0.7 - 3.8]				86.5	9.4	2.4			**0.3**	**1.5**							
	Swine (90)	N/A	**0.0**	[0.0 - 4.0]				95.6	4.4												
Macrolides																					
Azithromycin	Humans (2344)	N/A	**0.2**	[0.1 - 0.5]						0.2	0.4	11.2	80.4	7.3	0.2	**0.2**					
	Retail Chicken (158)	N/A	**0.6**	[0.0 - 3.5]								4.4	91.8	3.2		**0.6**					
	Ground Turkey (162)	N/A	**0.0**	[0.0 - 2.3]								7.4	79.0	12.4	1.2						
	Ground Beef (9)	N/A	**0.0**	[0.0 - 33.6]									100.0								
	Pork Chops (28)	N/A	**0.0**	[0.0 - 12.3]								21.4	57.1	21.4							
	Chickens (491)	N/A	**0.0**	[0.0 - 0.7]				0.2			0.8	16.1	75.4	7.5							
	Turkeys (103)	N/A	**0.0**	[0.0 - 3.5]								17.5	73.8	8.7							
	Cattle (340)	N/A	**0.3**	[0.0 - 1.6]						0.3		4.1	81.5	13.2	0.6	**0.3**					
	Swine (90)	N/A	**0.0**	[0.0 - 4.0]									75.6	23.3	1.1						
Penicillins																					
Ampicillin	Humans (2344)	0.1	**9.1**	[8.0 - 10.3]							86.9	3.5	0.3	0.1	0.1	**0.2**	**8.9**				
	Retail Chicken (158)	0.0	**40.5**	[32.8 - 48.6]							50.0	8.9	0.6				**40.5**				
	Ground Turkey (162)	0.0	**58.0**	[50.0 - 65.7]							38.3	3.7				**0.6**	**57.4**				
	Ground Beef (9)	0.0	**11.1**	[0.3 - 48.2]							88.9						**11.1**				
	Pork Chops (28)	0.0	**46.4**	[27.5 - 66.1]							35.7	10.7	7.1				**46.4**				
	Chickens (491)	0.0	**7.3**	[5.2 - 10.0]							89.6	2.6	0.2	0.2		**0.2**	**7.1**				
	Turkeys (103)	0.0	**27.2**	[18.9 - 36.8]							71.8	1.0					**27.2**				
	Cattle (340)	0.0	**17.1**	[13.2 - 21.5]							79.4	2.1	1.2	0.3			**17.1**				
	Swine (90)	0.0	**11.1**	[5.5 - 19.5]							85.6	3.3					**11.1**				
Phenicols																					
Chloramphenicol	Humans (2344)	0.6	**4.4**	[3.6 - 5.3]								0.9	51.0	43.1	0.6	**0.1**	**4.3**				
	Retail Chicken (158)	0.6	**0.6**	[0.0 - 3.5]								0.6	53.8	44.3	0.6	**0.6**					
	Ground Turkey (162)	1.2	**3.7**	[1.4 - 7.9]									37.0	58.0	1.2	**1.9**	**1.9**				
	Ground Beef (9)	0.0	**0.0**	[0.0 - 33.6]									44.4	55.6							
	Pork Chops (28)	3.6	**17.9**	[6.1 - 36.9]									39.3	39.3	3.6	**7.1**	**10.7**				
	Chickens (491)	0.4	**0.4**	[0.0 - 1.5]								10.2	62.7	26.3	0.4	**0.2**	**0.2**				
	Turkeys (103)	0.0	**1.0**	[0.0 - 5.3]								5.8	64.1	29.1			**1.0**				
	Cattle (340)	0.0	**17.9**	[14.0 - 22.4]								0.3	44.4	37.4		**0.6**	**17.4**				
	Swine (90)	2.2	**4.4**	[1.2 - 11.0]									28.9	64.4	2.2		**4.4**				

[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 the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 8d. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 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
Quinolones																					
Ciprofloxacin	Humans (2344)	2.8	**0.2**	[0.0 - 0.4]	91.9	4.9	0.2	1.0	0.9	0.9	**0.1**			**0.1**							
	Retail Chicken (158)	0.0	**0.0**	[0.0 - 2.3]	84.8	14.6	0.6														
	Ground Turkey (162)	0.0	**0.0**	[0.0 - 2.3]	92.6	7.4															
	Ground Beef (9)	0.0	**0.0**	[0.0 - 33.6]	77.8	22.2															
	Pork Chops (28)	0.0	**0.0**	[0.0 - 12.3]	78.6	21.4															
	Chickens (491)	0.0	**0.0**	[0.0 - 0.7]	91.4	8.6															
	Turkeys (103)	0.0	**0.0**	[0.0 - 3.5]	97.1	2.9															
	Cattle (340)	1.8	**0.6**	[0.1 - 2.1]	92.1	5.0	0.6	0.6	0.6	0.6	**0.3**			**0.3**							
	Swine (90)	0.0	**0.0**	[0.0 - 4.0]	95.6	4.4															
Nalidixic Acid	Humans (2344)	N/A	**2.4**	[1.8 - 3.1]						0.2	0.6	47.4	48.1	0.9	0.4	**0.1**	**2.3**				
	Retail Chicken (158)	N/A	**0.0**	[0.0 - 2.3]							1.3	33.5	63.3	1.3	0.6						
	Ground Turkey (162)	N/A	**0.0**	[0.0 - 2.3]								25.3	73.5	1.2							
	Ground Beef (9)	N/A	**0.0**	[0.0 - 33.6]								55.6	44.4								
	Pork Chops (28)	N/A	**0.0**	[0.0 - 12.3]								42.9	50.0	7.1							
	Chickens (491)	N/A	**0.0**	[0.0 - 0.7]						0.4	3.5	62.3	33.6	0.2							
	Turkeys (103)	N/A	**0.0**	[0.0 - 3.5]							1.9	71.8	26.2								
	Cattle (340)	N/A	**1.8**	[0.7 - 3.8]								62.6	34.1	0.9	0.6	**0.3**	**1.5**				
	Swine (90)	N/A	**0.0**	[0.0 - 4.0]								61.1	38.9								
Tetracyclines																					
Tetracycline	Humans (2344)	0.2	**10.5**	[9.2 - 11.8]									89.4	0.2	**0.3**	**1.9**	**8.2**				
	Retail Chicken (158)	0.0	**65.8**	[57.9 - 73.2]									34.2		**1.9**		**63.9**				
	Ground Turkey (162)	2.5	**64.8**	[56.9 - 72.1]									32.7	2.5	**0.6**	**1.9**	**62.3**				
	Ground Beef (9)	0.0	**44.4**	[13.7 - 78.8]									55.6			**11.1**	**33.3**				
	Pork Chops (28)	0.0	**39.3**	[21.5 - 59.4]									60.7			**3.6**	**35.7**				
	Chickens (491)	0.4	**40.9**	[36.6 - 45.4]									58.7	0.4		**1.2**	**39.7**				
	Turkeys (103)	0.0	**45.6**	[35.8 - 55.7]									54.4				**45.6**				
	Cattle (340)	0.3	**30.6**	[25.7 - 35.8]									69.1	0.3	**0.9**	**2.9**	**26.8**				
	Swine (90)	0.0	**41.1**	[30.8 - 52.0]									58.9		**1.1**	**3.3**	**36.7**				

[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 the range of dilutions tested for each antimicrobial.. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 9a. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
		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 Chops			10	5	11	9	8	18	23	8	20	28
		Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
		Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
		Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
		Swine	451	418	379	211	308	301	304	211	111	120	111	90
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	2.7% 37	1.9% 27	1.4% 27	1.4% 26	1.3% 24	2.2% 44	2.0% 44	2.1% 45	1.5% 35	1.3% 28	1.0% 24	1.7% 40
		Retail Chicken			10.0% 6	6.0% 5	3.8% 6	3.3% 5	9.2% 14	6.1% 6	7.1% 14	3.3% 9	6.4% 11	3.8% 6
		Ground Turkey			14.9% 11	22.8% 26	20.4% 29	26.8% 49	28.9% 46	24.7% 47	27.6% 68	18.7% 36	16.8% 34	32.1% 52
		Ground Beef			0.0% 0	0.0% 0	0.0% 0	25.0% 2	0.0% 0	7.7% 1	8.3% 2	14.3% 2	0.0% 0	0.0% 0
		Pork Chops			30.0% 3	0.0% 0	0.0% 0	0.0% 0	50.0% 4	5.6% 1	13.0% 3	0.0% 0	10.0% 2	3.6% 1
		Chickens	14.9% 175	7.9% 103	5.5% 83	6.3% 73	4.9% 63	4.3% 85	5.7% 79	4.5% 45	5.6% 35	5.6% 31	4.6% 26	3.5% 17
		Turkeys	16.2% 84	20.9% 115	19.3% 47	21.0% 55	25.4% 60	22.9% 52	16.4% 50	12.9% 35	16.9% 25	14.9% 18	19.9% 30	14.6% 15
		Cattle	2.1% 29	2.1% 19	2.6% 26	2.7% 18	1.8% 11	2.4% 8	3.9% 15	1.6% 7	1.6% 7	2.0% 4	4.9% 12	2.1% 7
		Swine	1.3% 6	1.4% 6	0.8% 3	0.5% 1	1.3% 4	2.7% 8	2.0% 6	0.9% 2	2.7% 3	0.0% 0	2.7% 3	0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	5.6% 77	4.8% 68	3.8% 76	3.5% 64	2.8% 50	3.4% 70	2.9% 63	2.8% 61	2.1% 50	2.5% 54	2.2% 54	1.7% 39
		Retail Chicken			6.7% 4	4.8% 4	11.5% 18	4.6% 7	9.9% 15	5.1% 5	10.6% 21	15.4% 42	8.2% 14	11.4% 18
		Ground Turkey			18.9% 14	27.2% 31	18.3% 26	20.2% 37	15.1% 24	23.7% 45	17.9% 44	6.7% 13	15.8% 32	14.8% 24
		Ground Beef			0.0% 0	0.0% 0	0.0% 0	25.0% 2	5.3% 1	0.0% 0	8.3% 2	14.3% 2	14.3% 1	11.1% 1
		Pork Chops			10.0% 1	0.0% 0	9.1% 1	0.0% 0	25.0% 2	5.6% 1	0.0% 0	12.5% 1	10.0% 2	7.1% 2
		Chickens	4.1% 48	2.4% 31	2.0% 30	2.8% 32	2.7% 34	2.5% 49	3.6% 49	3.4% 34	3.4% 21	3.1% 17	4.3% 24	0.6% 3
		Turkeys	21.4% 111	22.9% 126	24.2% 59	16.0% 42	14.4% 34	19.8% 45	10.5% 32	16.2% 44	14.2% 21	10.7% 13	19.2% 29	8.7% 9
		Cattle	6.6% 92	6.9% 62	10.1% 102	13.7% 92	8.9% 54	13.1% 43	9.5% 37	7.7% 34	9.9% 44	9.0% 18	12.6% 31	6.2% 21
		Swine	9.3% 42	6.9% 29	4.2% 16	5.7% 12	3.9% 12	5.0% 15	8.6% 26	7.1% 15	3.6% 4	4.2% 5	10.8% 12	3.3% 3
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	16.3% 223	17.1% 241	13.2% 264	15.0% 279	12.0% 213	11.1% 225	10.7% 233	10.3% 222	10.0% 238	8.9% 196	8.6% 210	9.8% 230
		Retail Chicken			28.3% 17	26.5% 22	28.0% 44	30.1% 46	36.2% 55	30.3% 30	23.7% 47	23.2% 63	25.7% 44	38.6% 61
		Ground Turkey			37.8% 28	45.6% 52	34.5% 49	44.3% 81	40.9% 65	45.8% 87	58.5% 144	28.0% 54	31.7% 64	56.2% 91
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2	0.0% 0	20.8% 5	28.6% 4	42.9% 3	33.3% 3
		Pork Chops			70.0% 7	40.0% 2	27.3% 3	33.3% 3	25.0% 2	16.7% 3	13.0% 3	37.5% 3	45.0% 9	57.1% 16
		Chickens	28.6% 335	21.0% 275	22.9% 343	19.6% 227	22.2% 284	23.3% 464	21.2% 293	19.3% 192	25.2% 157	30.5% 168	36.0% 203	35.8% 176
		Turkeys	41.9% 217	46.7% 257	37.7% 92	29.4% 77	33.9% 80	40.1% 91	28.9% 88	34.7% 94	32.4% 48	38.8% 47	27.8% 42	22.3% 23
		Cattle	21.3% 296	20.3% 181	25.9% 261	28.7% 192	20.9% 127	24.3% 80	23.7% 92	19.8% 87	23.0% 102	22.0% 44	26.7% 66	19.4% 66
		Swine	39.2% 177	35.6% 149	40.1% 152	30.8% 65	36.4% 112	36.5% 110	26.3% 80	27.0% 57	29.7% 33	29.2% 35	31.5% 35	18.9% 17
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	3.9% 54	4.7% 66	5.3% 106	4.6% 86	3.7% 66	3.2% 65	3.7% 81	3.3% 70	3.1% 73	3.4% 75	2.9% 70	2.6% 60
		Retail Chicken			10.0% 6	25.3% 21	24.8% 39	21.6% 33	19.1% 29	16.2% 16	22.2% 44	37.5% 102	33.9% 58	33.5% 53
		Ground Turkey			12.2% 9	11.4% 13	7.7% 11	8.7% 16	5.0% 8	5.3% 10	5.7% 14	5.7% 11	17.3% 35	21.0% 34
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0	0.0% 0	8.3% 2	14.3% 2	28.6% 2	11.1% 1
		Pork Chops			20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2	0.0% 0	3.6% 1
		Chickens	7.3% 86	4.5% 59	10.2% 153	9.7% 112	12.4% 159	12.1% 241	12.9% 178	15.6% 155	8.7% 54	12.9% 71	11.7% 66	6.3% 31
		Turkeys	3.5% 18	6.9% 38	3.7% 9	1.5% 4	4.7% 11	3.5% 8	5.6% 17	11.1% 30	5.4% 8	13.2% 16	15.2% 23	11.7% 12
		Cattle	9.9% 138	11.8% 105	17.7% 178	21.0% 141	13.5% 82	21.0% 69	18.5% 72	15.5% 68	16.5% 73	15.0% 30	21.5% 53	14.7% 50
		Swine	1.8% 8	2.6% 11	3.7% 14	3.8% 8	1.9% 6	4.3% 13	2.3% 7	3.3% 7	4.5% 5	4.2% 5	3.6% 4	2.2% 2

Table 9b. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
		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 Chops			10	5	11	9	8	18	23	8	20	28
		Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
		Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
		Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
		Swine	451	418	379	211	308	301	304	211	111	120	111	90
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	3.2% 44	3.4% 48	4.3% 86	4.3% 79	3.4% 61	3.0% 62	3.5% 77	2.9% 63	3.0% 72	3.2% 71	2.6% 63	2.6% 60
		Retail Chicken			10.0% 6	25.3% 21	24.8% 39	20.9% 32	18.4% 28	15.2% 15	21.2% 42	33.1% 90	28.1% 48	25.9% 41
		Ground Turkey			8.1% 6	2.6% 3	4.9% 7	7.1% 13	5.0% 8	5.3% 10	4.9% 12	5.7% 11	15.8% 32	17.9% 29
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0	0.0% 0	8.3% 2	14.3% 2	28.6% 2	0.0% 0
		Pork Chops			20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2	0.0% 0	10.7% 3
		Chickens	7.2% 85	4.1% 53	8.7% 130	8.2% 95	12.4% 159	12.0% 238	12.8% 176	13.0% 129	8.0% 50	11.4% 63	11.3% 64	6.5% 32
		Turkeys	3.3% 17	4.5% 25	2.5% 6	1.1% 3	5.1% 12	3.5% 8	5.3% 16	9.2% 25	5.4% 8	12.4% 15	15.2% 23	11.7% 12
		Cattle	9.1% 126	11.1% 99	15.9% 160	17.8% 119	13.2% 80	19.8% 65	17.7% 69	15.0% 66	14.7% 65	13.5% 27	20.6% 51	13.8% 47
		Swine	1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.9% 6	3.7% 11	2.0% 6	2.8% 6	4.5% 5	4.2% 5	1.8% 2	2.2% 2
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	3.2% 44	4.1% 58	4.4% 87	4.5% 83	3.4% 60	2.9% 60	3.6% 79	3.3% 70	3.1% 73	3.4% 75	2.8% 69	2.5% 58
		Retail Chicken			10.0% 6	25.3% 21	24.8% 39	20.9% 32	19.1% 29	16.2% 16	22.2% 44	37.1% 101	35.1% 60	34.2% 54
		Ground Turkey			8.1% 6	2.6% 3	4.9% 7	7.1% 13	5.0% 8	5.3% 10	4.9% 12	5.7% 11	16.3% 33	20.4% 33
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0	0.0% 0	8.3% 2	14.3% 2	28.6% 2	11.1% 1
		Pork Chops			20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2	0.0% 0	7.1% 2
		Chickens	7.6% 89	4.1% 54	10.2% 153	9.8% 113	12.4% 159	12.2% 242	12.8% 177	15.4% 153	8.7% 54	12.7% 70	12.1% 68	6.1% 30
		Turkeys	3.3% 17	5.1% 28	3.3% 8	1.5% 4	4.7% 11	3.5% 8	5.3% 16	11.1% 30	5.4% 8	12.4% 15	15.2% 23	11.7% 12
		Cattle	9.8% 136	11.4% 102	17.4% 175	21.0% 141	13.3% 81	21.6% 71	18.8% 73	15.5% 68	16.3% 72	14.5% 29	21.5% 53	13.2% 45
		Swine	1.3% 6	2.2% 9	3.2% 12	4.3% 9	1.9% 6	3.7% 11	2.0% 6	2.8% 6	4.5% 5	4.2% 5	1.8% 2	2.2% 2
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	3.2% 44	3.7% 52	4.4% 87	4.4% 81	3.3% 59	2.9% 59	3.7% 80	3.3% 70	3.1% 73	3.4% 75	2.9% 70	2.5% 58
		Retail Chicken			10.0% 6	26.5% 22	24.8% 39	21.6% 33	19.1% 29	16.2% 16	22.2% 44	37.9% 103	34.5% 59	33.5% 53
		Ground Turkey			8.1% 6	2.6% 3	5.6% 8	7.1% 13	5.0% 8	5.8% 11	4.9% 12	5.7% 11	16.3% 33	22.2% 36
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0	0.0% 0	8.3% 2	14.3% 2	28.6% 2	11.1% 1
		Pork Chops			20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2	0.0% 0	7.1% 2
		Chickens	7.4% 87	4.1% 54	9.9% 149	9.7% 112	12.3% 158	12.2% 242	12.8% 177	15.6% 155	8.7% 54	12.9% 71	11.9% 67	6.3% 31
		Turkeys	3.1% 16	4.7% 26	3.3% 8	1.1% 3	4.7% 11	3.5% 8	5.3% 16	11.1% 30	5.4% 8	12.4% 15	15.2% 23	11.7% 12
		Cattle	9.9% 137	11.3% 101	17.3% 174	21.0% 141	13.5% 82	20.7% 68	18.5% 72	15.9% 70	16.0% 71	14.5% 29	21.5% 53	14.4% 49
		Swine	1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.6% 5	3.7% 11	1.6% 5	2.4% 5	4.5% 5	4.2% 5	1.8% 2	2.2% 2
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Humans	17.1% 234	17.8% 251	12.9% 258	15.1% 280	13.3% 237	12.6% 256	12.1% 263	12.3% 264	10.1% 240	9.9% 217	9.0% 221	8.6% 202
		Retail Chicken			16.7% 10	14.5% 12	28.7% 45	17.0% 26	23.0% 35	25.3% 25	38.9% 77	48.2% 131	46.2% 79	44.9% 71
		Ground Turkey			20.3% 15	33.3% 38	28.2% 40	34.4% 63	32.1% 51	34.7% 66	27.6% 68	20.2% 39	25.7% 52	26.5% 43
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2	7.7% 1	20.8% 5	35.7% 5	42.9% 3	0.0% 0
		Pork Chops			70.0% 7	40.0% 2	18.2% 2	33.3% 3	75.0% 6	16.7% 3	30.4% 7	37.5% 3	50.0% 10	25.0% 7
		Chickens	18.4% 216	11.8% 154	8.9% 133	10.3% 119	11.9% 152	8.5% 169	10.7% 148	10.4% 103	13.3% 83	10.0% 55	12.4% 70	7.9% 39
		Turkeys	25.1% 130	38.0% 209	30.3% 74	28.2% 74	36.4% 86	37.0% 84	27.3% 83	25.5% 69	24.3% 36	28.9% 35	25.2% 38	22.3% 23
		Cattle	19.9% 276	19.7% 176	22.3% 225	25.1% 168	22.7% 138	27.4% 90	24.2% 94	21.6% 95	24.8% 110	24.5% 49	26.3% 65	20.0% 68
		Swine	35.7% 161	34.9% 146	34.6% 131	25.1% 53	37.0% 114	32.9% 99	26.6% 81	30.8% 65	31.5% 35	30.8% 37	28.8% 32	17.8% 16

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

Table 9c. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
		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 Chops			10	5	11	9	8	18	23	8	20	28
		Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
		Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
		Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
		Swine	451	418	379	211	308	301	304	211	111	120	111	90
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	2.0% 28	2.0% 28	1.4% 28	1.9% 36	1.7% 31	1.7% 34	1.7% 36	1.5% 33	1.6% 37	1.7% 38	1.6% 38	1.2% 28
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 2	0.0% 0	0.0% 0	0.4% 1	0.0% 0	1.3% 2
		Ground Turkey			1.4% 1	0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.5% 1	0.4% 1	1.6% 3	0.0% 0	3.7% 6
		Ground Beef			0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Pork Chops			20.0% 2	0.0% 0	0.0% 0	11.1% 1	50.0% 4	5.6% 1	0.0% 0	25.0% 2	0.0% 0	0.0% 0
		Chickens	0.4% 5	0.5% 6	0.8% 12	0.3% 4	0.2% 3	0.2% 4	0.1% 1	0.0% 0	0.3% 2	0.2% 1	0.0% 0	0.2% 1
		Turkeys	1.5% 8	2.5% 14	2.5% 6	2.3% 6	0.8% 2	1.8% 4	1.0% 3	1.1% 3	1.4% 2	1.7% 2	0.0% 0	0.0% 0
		Cattle	2.2% 30	2.6% 23	2.5% 25	3.3% 22	1.5% 9	4.9% 16	4.6% 18	3.0% 13	4.5% 20	1.5% 3	4.5% 11	1.8% 6
		Swine	0.9% 4	0.0% 0	1.6% 6	2.4% 5	1.6% 5	2.3% 7	2.0% 6	1.9% 4	2.7% 3	2.5% 3	1.8% 2	0.0% 0
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans												0.2% 5
		Retail Chicken												0.6% 1
		Ground Turkey												0.0% 0
		Ground Beef												0.0% 0
		Pork Chops												0.0% 0
		Chickens												0.0% 0
		Turkeys												0.0% 0
		Cattle												0.3% 1
		Swine												0.0% 0
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	15.9% 218	17.5% 247	13.0% 259	13.6% 253	12.1% 216	11.4% 232	10.9% 237	10.1% 217	9.7% 232	9.8% 216	9.1% 223	9.1% 213
		Retail Chicken			16.7% 10	33.7% 28	30.6% 48	26.8% 41	22.4% 34	18.2% 18	28.3% 56	45.6% 124	39.2% 67	40.5% 64
		Ground Turkey			16.2% 12	28.9% 33	20.4% 29	26.8% 49	25.8% 41	42.6% 81	51.2% 126	58.0% 112	48.0% 97	58.0% 94
		Ground Beef			22.2% 2	40.0% 4	21.4% 3	25.0% 2	10.5% 2	0.0% 0	12.5% 3	28.6% 4	28.6% 2	11.1% 1
		Pork Chops			40.0% 4	40.0% 2	9.1% 1	22.2% 2	25.0% 2	5.6% 1	13.0% 3	37.5% 3	15.0% 3	46.4% 13
		Chickens	13.0% 152	9.4% 123	14.3% 215	13.7% 159	14.5% 185	14.0% 279	14.9% 205	17.0% 169	10.6% 66	13.8% 76	13.7% 77	7.3% 36
		Turkeys	16.2% 84	19.5% 107	18.0% 44	18.7% 49	22.0% 52	22.9% 52	25.3% 77	36.9% 100	32.4% 48	38.8% 47	44.4% 67	27.2% 28
		Cattle	18.7% 259	17.9% 160	23.9% 241	28.1% 188	19.3% 117	26.7% 88	22.4% 87	20.0% 88	21.7% 96	22.5% 45	26.3% 65	17.1% 58
		Swine	18.8% 85	11.7% 49	13.7% 52	12.8% 27	16.2% 50	13.6% 41	11.5% 35	18.0% 38	14.4% 16	19.2% 23	17.1% 19	11.1% 10
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	10.1% 138	11.6% 164	8.6% 172	10.1% 187	7.6% 136	7.8% 159	6.4% 139	7.3% 156	6.1% 146	5.7% 125	5.0% 122	4.4% 103
		Retail Chicken			0.0% 0	2.4% 2	1.9% 3	0.7% 1	2.6% 4	1.0% 1	0.5% 1	0.0% 0	2.3% 4	0.6% 1
		Ground Turkey			1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1	1.6% 3	1.6% 4	1.6% 3	2.5% 5	3.7% 6
		Ground Beef			22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	0.0% 0	12.5% 3	21.4% 3	42.9% 3	0.0% 0
		Pork Chops			40.0% 4	40.0% 2	18.2% 2	22.2% 2	0.0% 0	0.0% 0	0.0% 0	12.5% 1	15.0% 3	17.9% 5
		Chickens	4.6% 54	2.5% 33	2.4% 36	2.1% 24	1.3% 16	1.8% 36	1.7% 24	1.8% 18	1.8% 11	1.6% 9	3.0% 17	0.4% 2
		Turkeys	4.1% 21	3.8% 21	5.3% 13	4.2% 11	4.7% 11	4.8% 11	3.9% 12	5.5% 15	2.7% 4	3.3% 4	4.6% 7	1.0% 1
		Cattle	15.1% 209	16.5% 147	20.6% 208	25.1% 168	17.6% 107	21.9% 72	19.8% 77	20.0% 88	19.6% 87	21.0% 42	25.1% 62	17.9% 61
		Swine	12.4% 56	7.7% 32	10.0% 38	8.5% 18	12.7% 39	10.6% 32	7.9% 24	15.2% 32	9.9% 11	15.0% 18	8.1% 9	4.4% 4

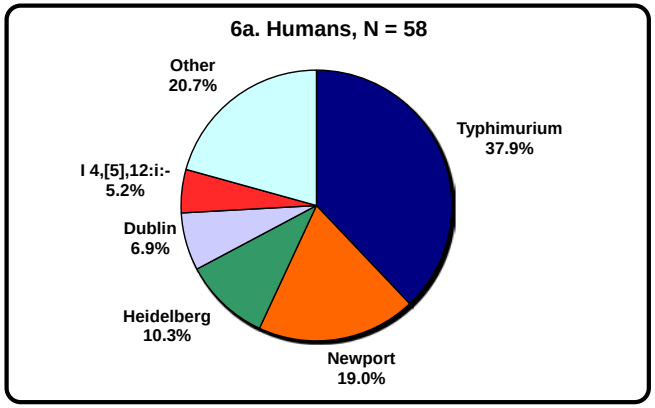
Table 9d. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

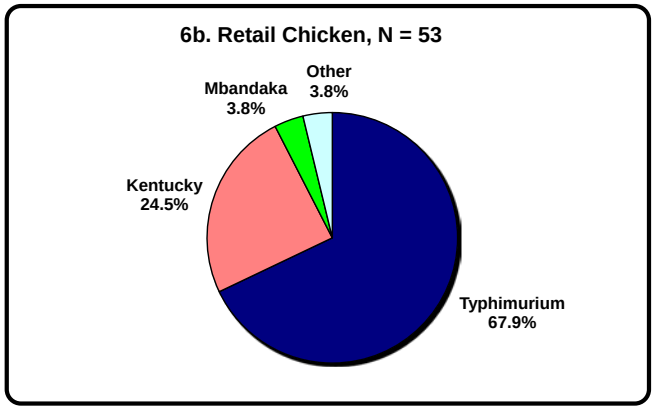
Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
		Retail Chicken			60	83	157	153	152	99	198	272	171	158
		Ground Turkey			74	114	142	183	159	190	246	193	202	162
		Ground Beef			9	10	14	8	19	13	24	14	7	9
		Pork Chops			10	5	11	9	8	18	23	8	20	28
		Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
		Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
		Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
		Swine	451	418	379	211	308	301	304	211	111	120	111	90
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.4% 5	0.2% 3	0.1% 1	0.2% 4	0.3% 5	0.1% 2	0.1% 3	0.1% 2	0.2% 5	0.3% 7	0.2% 6	0.2% 4
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			2.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.4% 2	0.2% 1	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 2
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	2.3% 32	2.3% 32	1.6% 32	1.9% 36	2.2% 39	1.9% 38	2.4% 52	2.2% 48	2.1% 49	1.8% 39	2.0% 48	2.4% 57
		Retail Chicken			0.0% 0	1.2% 1	0.0% 0	0.7% 1	0.7% 1	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0
		Ground Turkey			8.1% 6	4.4% 5	0.0% 0	1.1% 2	0.0% 0	2.6% 5	0.4% 1	0.0% 0	0.5% 1	0.0% 0
		Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 2	0.0% 0	0.0% 0
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	0.5% 6	0.0% 0	0.8% 12	0.4% 5	0.5% 6	0.3% 6	0.1% 2	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	5.4% 28	5.1% 28	5.3% 13	3.8% 10	2.1% 5	2.2% 5	0.7% 2	1.1% 3	0.7% 1	0.8% 1	0.7% 1	0.0% 0
		Cattle	0.4% 6	0.4% 4	0.4% 4	0.4% 3	2.0% 12	1.5% 5	0.5% 2	0.7% 3	0.7% 3	1.0% 2	2.8% 7	1.8% 6
		Swine	0.2% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	18.7% 256	19.9% 280	14.9% 298	16.3% 302	13.6% 242	13.9% 282	13.5% 293	14.5% 310	11.5% 275	11.9% 261	11.0% 270	10.5% 245
		Retail Chicken			33.3% 20	27.7% 23	46.5% 73	43.8% 67	46.7% 71	41.4% 41	46.5% 92	60.3% 164	56.1% 96	65.8% 104
		Ground Turkey			55.4% 41	39.5% 45	56.3% 80	39.9% 73	56.0% 89	67.4% 128	66.3% 163	64.8% 125	54.5% 110	64.8% 105
		Ground Beef			22.2% 4	40.0% 4	14.3% 2	12.5% 1	21.1% 4	0.0% 0	20.8% 5	42.9% 6	42.9% 3	44.4% 4
		Pork Chops			70.0% 7	80.0% 4	54.5% 6	55.6% 5	25.0% 2	50.0% 9	34.8% 8	37.5% 3	45.0% 9	39.3% 11
		Chickens	26.3% 308	21.9% 286	24.9% 374	26.2% 303	27.4% 351	28.3% 563	31.8% 439	35.5% 353	30.4% 190	33.9% 187	41.8% 236	40.9% 201
		Turkeys	56.2% 291	54.9% 302	54.5% 133	58.8% 154	48.3% 114	54.6% 124	61.8% 188	73.8% 200	64.2% 95	63.6% 77	57.6% 87	45.6% 47
		Cattle	25.8% 358	26.3% 235	32.0% 323	36.9% 247	31.8% 193	34.0% 112	30.3% 118	27.3% 120	29.3% 130	29.0% 58	33.6% 83	30.6% 104
		Swine	54.3% 245	53.1% 222	57.8% 219	43.1% 91	58.8% 181	54.8% 165	62.8% 191	54.5% 115	51.4% 57	53.3% 64	51.4% 57	41.1% 37

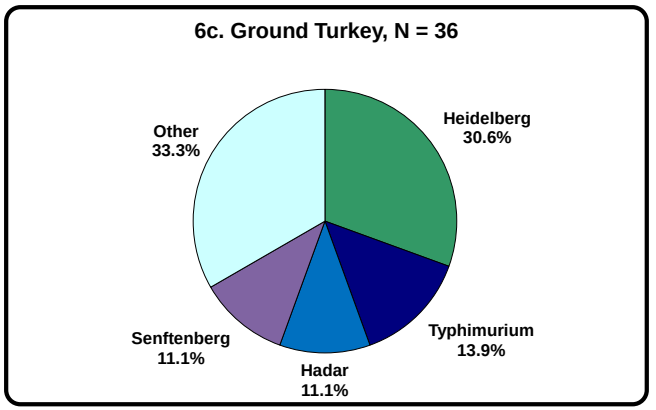
Table 10. Ceftriaxone-Resistant Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2011

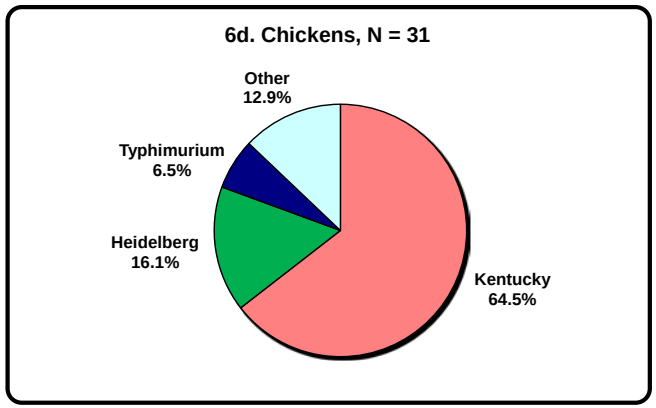
Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=58)	Typhimurium	22	37.9	**Retail Chicken (N=53)**	Typhimurium	36	67.9	**Chickens (N=31)**	Kentucky	20	64.5
	Newport	11	19.0		Kentucky	13	24.5		Heidelberg	5	16.1
	Heidelberg	6	10.3		Mbandaka	2	3.8		Typhimurium	2	6.5
	Dublin	4	6.9		Hadar	1	1.9		I 4,[5],12:i:-	1	3.2
	I 4,[5],12:i:-	3	5.2		Infantis	1	1.9		Enteritidis	1	3.2
	Agona	2	3.4						Infantis	1	3.2
	Senftenberg	2	3.4						Rubislaw	1	3.2
	Berta	1	1.7								
	Enteritidis	1	1.7								
	Infantis	1	1.7	**Ground Turkey (N=36)**	Heidelberg	11	30.6	**Turkeys (N=12)**	Albany	2	16.7
	Javiana	1	1.7		Typhimurium	5	13.9		Hadar	2	16.7
	Montevideo	1	1.7		Hadar	4	11.1		Schwarzengrund	2	16.7
	Muenster	1	1.7		Senftenberg	4	11.1		I 4,12:l,v:-	1	8.3
	Reading	1	1.7		Agona	2	5.6		Agona	1	8.3
	Saintpaul	1	1.7		Saintpaul	2	5.6		Heidelberg	1	8.3
					IIIa 18:z4,z23:-	1	2.8		Newport	1	8.3
					Alachua	1	2.8		Orion var. 15+	1	8.3
					Albany	1	2.8		Worthington	1	8.3
					Brandenburg	1	2.8				
					Bredeney	1	2.8				
					Infantis	1	2.8				
					Muenchen	1	2.8				
					Schwarzengrund	1	2.8				
				Ground Beef (N=1)	Kentucky	1	100.0	**Cattle (N=49)**	Dublin	21	42.9
									Newport	10	20.4
									Typhimurium	5	10.2
									Montevideo	4	8.2
									Reading	3	6.1
									Rough O:g,p:-	2	4.1
									I 4,[5],12:i:-	1	2.0
									Agona	1	2.0
									Infantis	1	2.0
									Meleagridis	1	2.0
				Pork Chops (N=2)	Agona	1	50.0	**Swine (N=2)**	Agona	1	50.0
					Hindmarsh	1	50.0		Infantis	1	50.0

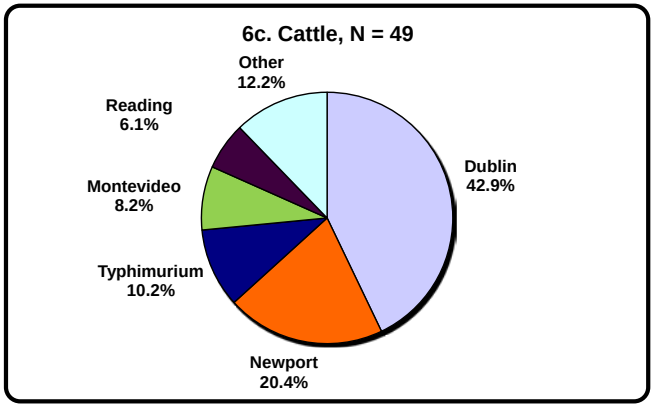
Figures 6a-d. Ceftriaxone-Resistant Non-Typhoidal *Salmonella* Isolates, by Source and Serotype, 2011[1]











[1] Pie charts are not provided for other sources due to the small number of ceftriaxone-resistant isolates. Table 10 shows a complete listing of ceftriaxone-resistant isolates by source and serotype

Figure 7. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftriaxone, by Year, 1996-2011

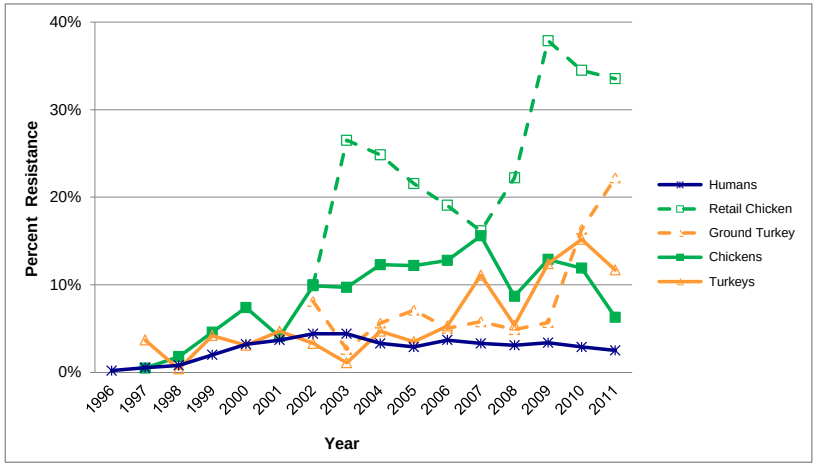
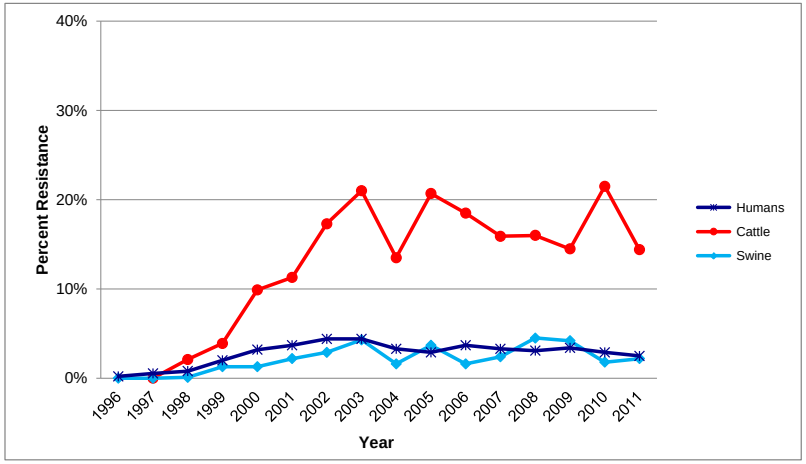


Figure 8. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Cattle, and Swine Resistant to Ceftriaxone, by Year, 1996-2011[1]



[1] Data for ground beef and pork chops are not included due to the small number of *Salmonella* isolates from these sources. Table 9 contains resistance data for *Salmonella* isolates from each source, by year

Table 11. Number of Non-Typhoidal *Salmonella* Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
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 Chops							10	5	11	9	8	18	23	8	20	28
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121	151	103
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200	247	340
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120	111	90

Nalidixic Acid Resistance

Table 12. Naldixic Acid-Resistant Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=57)	Enteritidis	28	49.1	Retail Chicken (N=0)				Chickens (N=0)			
	Hadar	2	3.5								
	Saintpaul	2	3.5								
	Choleraesuis	1	1.8								
	Dublin	1	1.8								
	Infantis	1	1.8								
	Kentucky	1	1.8								
	Montevideo	1	1.8								
	Newport	1	1.8								
	Oranienburg	1	1.8								
	Paratyphi B var. L(+) tartrate+	1	1.8								
	Senftenberg	1	1.8								
	Typhimurium	1	1.8								
	Virchow	1	1.8								
	Unknown serotype	13	22.8								
	Rough/Nonmotile isolates	1	1.8								
				Ground Turkey (N=0)				Turkeys (N=0)			
				Ground Beef (N=0)				Cattle (N=6)	Dublin	4	66.7
									Meleagridis	1	16.7
									Rough O:g,p:-	1	16.7
				Pork Chops (N=0)				Swine (N=0)			

Figure 9. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Retail Poultry, and Poultry Resistant to Nalidixic Acid, by Year, 1996-2011

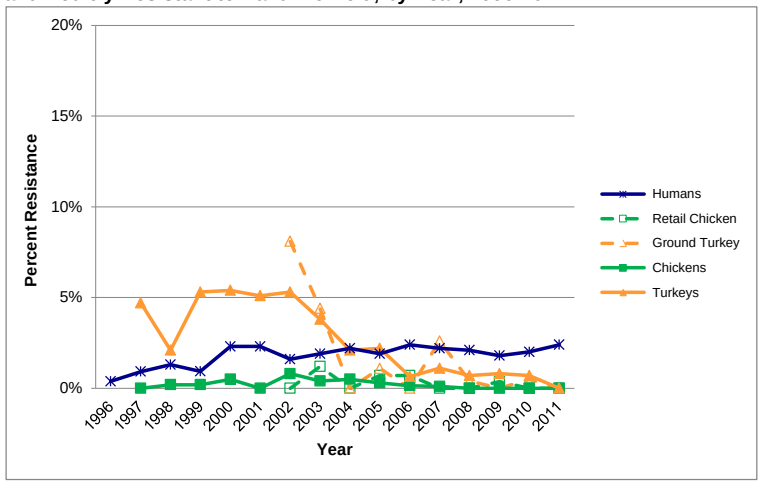
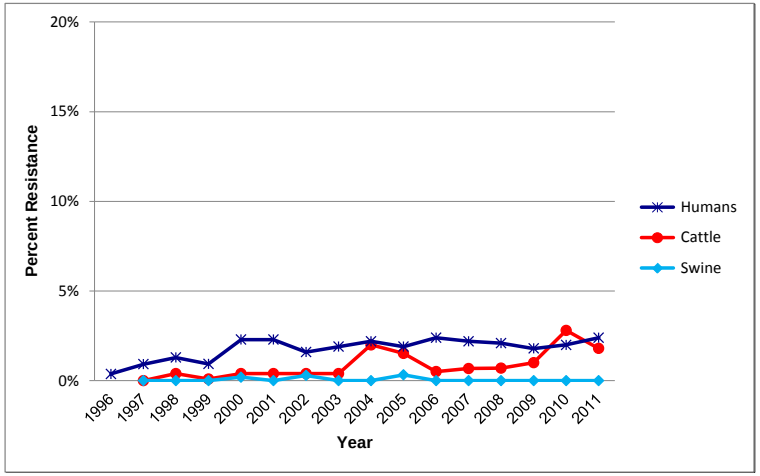


Figure 10. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Cattle, and Swine Resistant to Nalidixic Acid, by Year, 1996-2011[1]



[1] Data for ground beef and pork chops are not included due to the small number of *Salmonella* isolates from these sources. Table 9 contains resistance data for *Salmonella* isolates from each source, by year

Table 13. Number of Non-Typhoidal *Salmonella* Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
Retail Chickens							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 Chops							10	5	11	9	8	18	23	8	20	28
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121	151	103
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200	247	340
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120	111	90

Resistance among the most common *Salmonella* Serotypes

Table 14. Number of Non-Typhoidal *Salmonella* Isolates among the Most Common Serotypes from Humans with the Number of Resistant Isolates by Class and Agent, 2011

				Number of Isolates						Number of Resistant Isolates by Antimicrobial Class[1] and Agent													
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
Sources	*Salmonella* Serotype	No. of Isolates	% of Isolates	0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET
Humans	Enteritidis	391	16.7%	344	37	5	5			2	1	7	1	1	1	1	8	2		20			28	7
	Typhimurium	323	13.8%	223	7	23	50	20		7	13	83	22	22	22	22	88	6		83	63		1	88
	Newport	285	12.2%	269	3	2	1	9	1	2	1	12	11	11	11	11	13			11	10		1	13
	Javiana	170	7.3%	168	1	1							1	1	1	1				2				
	I 4,[5],12:i:-	82	3.5%	54	5	6	16	1		1		20	4	4	3	3	19	1		22	2			21
	Heidelberg	70	3.0%	39		28		3		14	15	26	7	6	6	6	5	1		21	3			24
	Montevideo	65	2.8%	61	1	2		1				2	1	1	1	1	2	1		1	1		1	4
	Infantis	63	2.7%	59		2	2			1		3	1	1	1	1	3	1		1	1		1	3
	Muenchen	49	2.1%	48	1						1													
	Braenderup	48	2.0%	45	1	1	1			1		2					2	1	1	1				3
	Oranienburg	48	2.0%	46			1	1				2					2	1	1	2	1		1	2
	Unknown serotype	54	2.3%	34	10	2	6	2		1	1	10		1			10	1		8	4		13	9
	Partially serotyped	24	1.0%	22	1		1					1					1			1				2
	Rough/Nonmotile Isolates	21	0.9%	12	3		6				1	6					6	1		7	1		1	7
	Other	651	27.8%	559	31	36	13	11	1	11	6	56	12	12	12	12	43	12	3	33	17	4	10	62
	Total	2344	100.0%	1983	101	108	102	48	2	40	39	230	60	60	58	58	202	28	5	213	103	4	57	245

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

Table 15. Number of Non-Typhoidal *Salmonella* Isolates among the Most Common Serotypes from Retail Chicken and Chickens with the Number of Resistant Isolates by Class and Agent, 2011

				Number of Isolates						Number of Resistant Isolates by Antimicrobial Class[1] and Agent													
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
Sources	*Salmonella* Serotype	No. of Isolates	% of Isolates	0	1	2-3	4-5	6-7	8-9	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
	Other	8	5.1%	5	1	1	1			1		3	1	1	1	1	1			1				1
	Total	158	100.0%	41	3	62	31	21		6	18	61	53	41	54	53	71	2	1	64	1			104
Chickens	Kentucky	227	46.2%	41	40	128	16	2		3		157	20	20	19	20	3			20	1			164
	Enteritidis	134	27.3%	131	2	1							1	1	1	1				2				1
	Typhimurium	30	6.1%	9		19	2			2		2	2	2	2	2	21			3				20
	Heidelberg	28	5.7%	20	1	3	1	3		4	2	4	5	5	5	5	5			6	1			3
	Infantis	16	3.3%	15		1							1	1	1	1				1				
	Other	56	11.4%	33	6	16	1			8	1	13	2	3	2	2	10	1		4				13
	Total	491		249	49	168	20	5		17	3	176	31	32	30	31	39	1		36	2			201

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

Table 16. Number of Non-Typhoidal *Salmonella* Isolates among the Most Common Serotypes from Ground Turkeys and Turkeys with the Number of Resistant Isolates by Class and Agent, 2011

Sources	*Salmonella* Serotype	No. of Isolates	% of Isolates	Number of Isolates: Number of Antimicrobial Classes to which Isolates are Resistant						Number of Resistant Isolates by Antimicrobial Class[1] and Agent												
										Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET
Ground Turkeys	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				
	Other	19	11.7%	4	5	6	2	2		5	2	9	5	5	5	5	5			7	1			10
	Total	162	100.0%	36	16	70	19	21		52	24	91	34	29	33	36	43	6		94	6			105
Turkeys	Hadar	20	19.4%		6	11	3			4	2	10	2	2	2	2	4			7				17
	IIIa 18:z4,z23:-	13	12.6%	12		1				1		1					1							
	Schwarzengrund	10	9.7%	6	1	1		2				2	2	2	2	2	3			2	1			4
	Muenchen	9	8.7%	4		5											5							5
	Saintpaul	6	5.8%	3		3				2		2								3				3
	Berta	5	4.9%	2	1	2				2		2					1			2				2
	Heidelberg	5	4.9%			4	1			3	1	3	1	1	1	1	2			3				4
	Albany	4	3.9%	2		2							2	2	2	2				2				
	Newport	4	3.9%	2	1			1			1		1	1	1	1	1			1				2
	Reading	4	3.9%	3		1											1							1
	Agona	3	2.9%			1	1	1		1	1		1	1	1	1	3			2				3
	Other	20	19.4%	8	4	5	3			2	4	3	3	3	3	3	2			6				6
	Total	103	100.0%	42	13	36	8	4		15	9	23	12	12	12	12	23			28	1			47

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

Table 17. Number of Non-Typhoidal *Salmonella* Isolates among the Most Common Serotypes from Ground Beef and Cattle with the Number of Resistant Isolates by Class and Agent, 2011

				Number of Isolates						Number of Resistant Isolates by Antimicrobial Class[1] and Agent													
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
Sources	*Salmonella* Serotype	No. of Isolates	% of Isolates	0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET
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
	Mbandaka	1	11.1%	1																				
	Montevideo	1	11.1%	1																				
	Total	9	100.0%	5		3	1				1	3	1		1	1				1				4
Cattle	Montevideo	99	29.1%	81	14			4				5	4	4	4	4	4			4	4			17
	Dublin	38	11.2%	2	1		13	21	1	7	18	28	22	18	18	21	34	2		27	31		4	35
	Muenster	24	7.1%	21	3																1			2
	Kentucky	18	5.3%	10	6	2						3												7
	Anatum	17	5.0%	15	2																			2
	Infantis	15	4.4%	14				1				1	1	1	1	1	1	1		1	1			1
	Cerro	14	4.1%	13	1																			1
	Meleagridis	14	4.1%	7	3	2	1		1			3	1	1	1	1	4	1	1	1	2	1	1	7
	Typhimurium	14	4.1%	6			3	5			2	8	5	5	5	5	8			8	6			8
	Newport	13	3.8%	3				10			1	10	10	10	10	10	10	1		10	10			10
	Mbandaka	7	2.1%	6		1											1	1						1
	Other	67	19.7%	52	4	5	1	4	1			8	7	8	6	7	6			7	6	1	1	13
	Total	340	100.0%	230	34	10	18	45	3	7	21	66	50	47	45	49	68	6	1	58	61	2	6	104

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

Table 18. Number of Non-Typhoidal *Salmonella* Isolates among the Most Common Serotypes from Pork Chops and Swine with the Number of Resistant Isolates by Class and Agent, 2011

				Number of Isolates						Number of Resistant Isolates by Antimicrobial Class[1] and Agent												
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
	Salmonella Serotype	No. of Isolates	% of Isolates	0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET
Pork Chops	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
	Berta	1	3.6%		1																			1
	Heidelberg	1	3.6%			1					1	1												1
	Hindmarsh	1	3.6%			1									1	1				1				1
	Infantis	1	3.6%	1																				
	Saintpaul	1	3.6%				1			1		1					1			1				1
	Uganda	1	3.6%	1																				
	Wothington	1	3.6%	1																				
	Total	28	100.0%	7	2	15	3	1		1	2	16	1	3	2	2	7			13	5			11
Swine	Adelaide	13	14.4%	13																				
	Johannesburg	12	13.3%	5	7																			7
	Derby	10	11.1%	3	3	4						4					4							7
	Infantis	10	11.1%	7		2		1			2	3	1	1	1	1	1			3	1			3
	Anatum	8	8.9%	4	4																			4
	Agona	5	5.6%		1	3		1				1	1	1	1	1	4			1	1			5
	Typhimurium	5	5.6%		1	1	3				1	4					4			3	2			4
	Uganda	5	5.6%	4	1																			
	Ohio	4	4.4%	4																				1
	Muenchen	2	2.2%	2																				
	I 4,[5],12:i:-	2	2.2%				2					2					2			2				2
	Other	14	15.6%	10	1	2	1					3					1			1				4
	Total	90	100.0%	52	18	12	6	2			3	17	2	2	2	2	16			10	4			37

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

Table 19a. Resistance Patterns among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
	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 Chops			10	5	11	9	8	18	23	8	20	28
	Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
	Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
	Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
	Swine	451	418	379	211	308	301	304	211	111	120	111	90
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	74.5% 1022	72.5% 1022	79.1% 1580	78.0% 1447	79.9% 1424	80.9% 1648	80.5% 1748	81.1% 1739	83.9% 2000	83.2% 1824	84.6% 2073	84.6% 1983
	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 Chops			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
	Chickens	56.9% 668	66.6% 871	62.0% 930	61.1% 708	62.7% 803	61.2% 1217	57.2% 790	53.9% 536	60.4% 377	56.1% 309	49.3% 278	50.7% 249
	Turkeys	33.4% 173	31.6% 174	29.9% 73	24.0% 63	33.5% 79	27.8% 63	28.0% 85	15.5% 42	21.6% 32	19.8% 24	25.2% 38	40.8% 42
	Cattle	70.0% 972	69.9% 624	64.3% 648	61.0% 409	65.6% 398	63.2% 208	67.6% 263	72.0% 316	68.8% 305	68.5% 137	61.1% 151	67.6% 230
	Swine	43.2% 195	43.5% 182	40.1% 152	53.6% 113	37.3% 115	44.5% 134	34.5% 105	43.1% 91	47.7% 53	44.2% 53	44.1% 49	57.8% 52
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	15.6% 214	16.7% 236	12.3% 245	14.2% 263	11.4% 204	12.0% 244	11.8% 256	11.1% 239	9.6% 228	9.6% 211	9.2% 225	9.1% 213
	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	0.0% 0	20.8% 5	35.7% 5	42.9% 3	11.1% 1
	Pork Chops			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
	Chickens	15.1% 177	10.2% 133	14.2% 213	13.5% 156	15.8% 202	15.1% 301	16.4% 226	17.8% 177	11.4% 71	15.6% 86	15.2% 86	7.9% 39
	Turkeys	21.6% 112	30.4% 167	24.2% 59	21.8% 57	27.1% 64	28.2% 64	27.3% 83	33.6% 91	29.7% 44	33.1% 40	37.1% 56	23.3% 24
	Cattle	19.8% 275	18.9% 169	24.5% 247	29.6% 198	21.1% 128	27.7% 91	23.9% 93	22.1% 97	23.5% 104	26.0% 52	28.7% 71	20.0% 68
	Swine	34.6% 156	30.6% 128	34.0% 129	23.7% 50	33.4% 103	31.9% 96	22.7% 69	28.0% 59	29.7% 33	31.7% 38	27.9% 31	15.6% 14
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	12.7% 174	13.5% 191	9.8% 195	11.4% 211	9.3% 165	9.1% 185	8.2% 177	8.2% 176	7.4% 177	7.3% 159	6.8% 166	6.5% 152
	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	0.0% 0	12.5% 3	35.7% 5	42.9% 3	11.1% 1
	Pork Chops			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
	Chickens	6.7% 79	3.6% 47	7.7% 115	6.8% 79	9.8% 126	8.7% 174	10.3% 142	12.3% 122	7.5% 47	11.1% 61	11.3% 64	5.1% 25
	Turkeys	10.0% 52	14.7% 81	11.1% 27	9.5% 25	10.2% 24	11.5% 26	12.2% 37	15.1% 41	10.1% 15	11.6% 14	17.9% 27	11.7% 12
	Cattle	17.4% 242	16.9% 151	22.1% 223	27.5% 184	18.8% 114	24.9% 82	22.1% 86	21.0% 92	21.9% 97	24.5% 49	25.5% 63	19.4% 66
	Swine	17.1% 77	9.1% 38	12.7% 48	10.9% 23	15.3% 47	13.3% 40	9.9% 30	17.5% 37	14.4% 16	15.0% 18	11.7% 13	8.9% 8
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	9.5% 131	10.3% 145	8.2% 164	9.8% 182	8.0% 142	7.2% 146	6.3% 137	6.9% 149	6.6% 157	6.2% 137	5.2% 128	4.6% 108
	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	0.0% 0	12.5% 3	14.3% 2	28.6% 2	11.1% 1
	Pork Chops			40.0% 4	40.0% 2	9.1% 1	22.2% 2	0.0% 0	0.0% 0	0.0% 0	25.0% 2	5.0% 1	10.7% 3
	Chickens	5.5% 64	3.1% 41	5.7% 85	4.9% 57	8.0% 103	5.9% 117	6.6% 91	7.4% 74	6.1% 38	7.8% 43	9.0% 51	3.5% 17
	Turkeys	4.8% 25	6.0% 33	6.6% 16	3.1% 8	5.5% 13	6.2% 14	5.9% 18	7.0% 19	4.1% 6	9.1% 11	9.3% 14	6.8% 7
	Cattle	14.0% 195	15.1% 135	19.3% 195	23.6% 158	17.8% 108	23.1% 76	20.1% 78	18.9% 83	19.0% 84	20.0% 40	23.1% 57	16.2% 55
	Swine	9.3% 42	7.2% 30	9.0% 34	9.5% 20	12.3% 38	10.3% 31	5.9% 18	11.4% 24	8.1% 9	14.2% 17	7.2% 8	4.4% 4

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

Table 19b. Resistance Patterns among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	1372	1410	1998	1855	1782	2036	2171	2145	2384	2193	2449	2344
	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 Chops			10	5	11	9	8	18	23	8	20	28
	Chickens	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491
	Turkeys	518	550	244	262	236	227	304	271	148	121	151	103
	Cattle	1388	893	1008	670	607	329	389	439	443	200	247	340
	Swine	451	418	379	211	308	301	304	211	111	120	111	90
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[1] Resistant	Humans	8.9% 122	10.1% 142	7.8% 156	9.3% 173	7.2% 129	6.9% 141	5.6% 121	6.3% 136	5.8% 138	5.1% 112	4.4% 107	3.9% 91
	Retail Chicken			0.0% 0	2.4% 2	1.9% 3	0.7% 1	2.6% 4	0.0% 0	0.5% 1	0.0% 0	1.2% 2	0.0% 0
	Ground Turkey			1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1	1.6% 3	1.6% 4	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	0.0% 0	12.5% 3	14.3% 2	28.6% 2	0.0% 0
	Pork Chops			40.0% 4	40.0% 2	9.1% 1	22.2% 2	0.0% 0	0.0% 0	0.0% 0	12.5% 1	5.0% 1	10.7% 3
	Chickens	4.3% 50	2.4% 32	1.9% 29	1.5% 17	0.9% 12	1.6% 31	1.6% 22	1.5% 15	1.4% 9	1.3% 7	2.3% 13	0.4% 2
	Turkeys	3.3% 17	3.6% 20	4.5% 11	2.3% 6	4.7% 11	4.0% 9	3.9% 12	4.8% 13	2.0% 3	3.3% 4	4.0% 6	1.0% 1
	Cattle	13.1% 182	14.6% 130	17.1% 172	18.1% 121	16.3% 99	20.4% 67	18.3% 71	16.2% 71	18.1% 80	15.0% 30	18.6% 46	12.6% 43
	Swine	8.6% 39	7.2% 30	7.7% 29	7.6% 16	12.0% 37	9.6% 29	5.3% 16	10.9% 23	8.1% 9	13.3% 16	7.2% 8	4.4% 4
6. At Least ACT/S[2] Resistant	Humans	0.9% 13	0.5% 7	1.1% 21	1.2% 23	0.6% 10	0.9% 18	0.7% 15	0.7% 16	0.5% 11	0.7% 15	0.4% 11	0.4% 9
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			1.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.5% 4
	Ground Beef			0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Pork Chops			20.0% 2	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0
	Chickens	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.1% 1	0.1% 2	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.8% 4	0.7% 4	0.8% 2	0.0% 0	0.4% 1	0.0% 0	0.3% 1	0.0% 0	0.7% 1	0.8% 1	0.0% 0	0.0% 0
	Cattle	1.7% 23	2.4% 21	2.4% 24	2.7% 18	1.2% 7	4.3% 14	4.1% 16	2.5% 11	3.8% 17	1.5% 3	4.5% 11	1.5% 5
	Swine	0.0% 0	1.0% 4	0.5% 2	0.9% 2	0.6% 2	1.7% 5	0.3% 1	1.9% 4	0.9% 1	1.7% 2	0.0% 0	0.0% 0
7. At Least ACSSuTAuCx[3] Resistant	Humans	2.6% 35	2.6% 36	3.4% 67	3.2% 60	2.4% 42	2.0% 41	2.0% 43	2.1% 46	1.8% 44	1.4% 30	1.3% 33	1.5% 36
	Retail Chicken			0.0% 0	0.0% 0	1.9% 3	0.0% 0	2.6% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			1.4% 1	0.9% 1	2.1% 3	0.5% 1	0.0% 0	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	0.0% 0	0.0% 0	0.0% 0	8.3% 2	14.3% 2	28.6% 2	0.0% 0
	Pork Chops			20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.6% 1
	Chickens	2.7% 32	1.1% 14	0.9% 13	1.0% 12	0.4% 5	0.9% 18	1.1% 15	1.4% 14	1.1% 7	1.3% 7	2.0% 11	0.4% 2
	Turkeys	1.9% 10	2.9% 16	1.6% 4	0.8% 2	2.1% 5	1.8% 4	2.3% 7	4.1% 11	2.0% 3	3.3% 4	1.3% 2	1.0% 1
	Cattle	8.9% 124	11.0% 98	14.6% 147	15.1% 101	12.0% 73	17.3% 57	16.2% 63	13.9% 61	14.7% 65	9.5% 19	16.2% 40	11.2% 38
	Swine	1.3% 6	2.2% 9	1.8% 7	1.9% 4	1.0% 3	2.7% 8	0.7% 2	0.5% 1	0.9% 1	1.7% 2	0.9% 1	2.2% 2
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.1% 1	0.1% 2	0.2% 4	0.1% 1	0.1% 2	0.0% 1	0.2% 4	0.2% 5	0.0% 1	0.2% 4	0.1% 2	0.1% 2
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.9% 1	0.0% 0	0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.0% 0	0.5% 1	0.0% 0
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 2	0.0% 0	0.0% 0
	Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Chickens	0.1% 1	0.0% 0	0.5% 8	0.0% 0	0.2% 2	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	1.2% 6	1.5% 8	1.2% 3	0.4% 1	0.8% 2	0.9% 2	0.3% 1	0.7% 2	0.0% 0	0.0% 0	0.7% 1	0.0% 0
	Cattle	0.1% 1	0.3% 3	0.2% 2	0.4% 3	1.0% 6	0.9% 3	0.3% 1	0.2% 1	0.7% 3	0.0% 0	1.2% 3	0.9% 3
	Swine	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

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

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

Table 20. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are Resistant to ≥ 3 Antimicrobial Classes, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=213)	Typhimurium	85	39.9	**Retail Chicken (N=71)**	Typhimurium	47	66.2	**Chickens (N=39)**	Kentucky	21	53.8
	I 4,[5],12:i:-	22	10.3		Kentucky	17	23.9		Heidelberg	5	12.8
	Heidelberg	21	9.9		Mbandaka	3	4.2		Typhimurium	5	12.8
	Newport	11	5.2		Enteritidis	2	2.8		I 4,[5],12:i:-	2	5.1
	Enteritidis	9	4.2		Hadar	1	1.4		Braenderup	1	2.6
	Dublin	6	2.8		Infantis	1	1.4		Brandenburg	1	2.6
	Agona	5	2.3						Enteritidis	1	2.6
	Infantis	4	1.9						Infantis	1	2.6
	Berta	3	1.4						Johannesburg	1	2.6
	Derby	3	1.4						Rubislaw	1	2.6
	Saintpaul	3	1.4								
	Braenderup	2	0.9								
	Montevideo	2	0.9	**Ground Turkey (N=81)**	Heidelberg	26	32.1	**Turkeys (N=25)**	Hadar	6	24.0
	Oranienburg	2	0.9		Hadar	16	19.8		Heidelberg	4	16.0
	Panama	2	0.9		Saintpaul	11	13.6		Agona	2	8.0
	Senftenberg	2	0.9		Typhimurium	7	8.6		Albany	2	8.0
	I 4,[5],12:e,h:-	1	0.5		Senftenberg	5	6.2		Berta	2	8.0
	IV 48:g,z51:-	1	0.5		IIIa 18:z4,z23:-	3	3.7		Saintpaul	2	8.0
	IV 50:z4,z23:-	1	0.5		Agona	2	2.5		Schwarzengrund	2	8.0
	Choleraesuis	1	0.5		Derby	2	2.5		Worthington	2	8.0
	Hadar	1	0.5		Schwarzerngrund	2	2.5		I 4,12:l,v:-	1	4.0
	Hvittingfoss	1	0.5		Alachua	1	1.2		Newport	1	4.0
	Javiana	1	0.5		Albany	1	1.2		Orion	1	4.0
	Kentucky	1	0.5		Brandenburg	1	1.2				
	Mississippi	1	0.5		Bredeney	1	1.2				
	Muenster	1	0.5		Infantis	1	1.2				
	Paratyphi B var. (+) tartrate+	1	0.5		Muenchen	1	1.2				
	Reading	1	0.5		Reading	1	1.2				
	Rissen	1	0.5								
	Uganda	1	0.5								
	Virchow	1	0.5	**Ground Beef (N=1)**	Kentucky	1	100.0	**Cattle (N=68)**	Dublin	35	51.5
	Unknown serotype	9	4.2						Newport	10	14.7
	Partially serotyped	1	0.5						Typhimurium	8	11.8
	Rough/Nonmotile isolates	6	2.8						Montevideo	4	5.9
									Meleagridis	3	4.4
									Reading	3	4.4
									Rough O:g,p:-	2	2.9
									I 4,[5],12:i:-	1	1.5
									Agona	1	1.5
									Infantis	1	1.5
				Pork Chops (N=8)	Typhimurium	4	50.0	**Swine (N=14)**	Derby	4	28.6
					Agona	1	12.5		Infantis	3	21.4
					Hadar	1	12.5		Typhimurium	3	21.4
					Hindmarsh	1	12.5		I 4,[5],12:i:-	2	14.3
					Saintpaul	1	12.5		Agona	1	7.1
									Bovismorbificans	1	7.1

Table 21. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are Resistant to ≥ 4 Antimicrobial Classes, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=152)	Typhimurium	70	46.1	**Retail Chicken (N=52)**	Typhimurium	39	75.0	**Chickens (N=25)**	Kentucky	18	72.0
	I 4,[5],12:i:-	17	11.2		Kentucky	7	13.5		Heidelberg	4	16.0
	Newport	11	7.2		Mbandaka	3	5.8		Typhimurium	2	8.0
	Dublin	6	3.9		Enteritidis	2	3.8		Brandenburg	1	4.0
	Enteritidis	5	3.3		Hadar	1	1.9				
	Agona	3	2.0								
	Heidelberg	3	2.0	**Ground Turkey (N=40)**	Heidelberg	13	32.5	**Turkeys (N=12)**	Hadar	3	25.0
	Infantis	2	1.3		Saintpaul	6	15.0		Agona	2	16.7
	Oranienburg	2	1.3		Hadar	5	12.5		Schwarzengrund	2	16.7
	Panama	2	1.3		Typhimurium	5	12.5		I 4,12:l,v:-	1	8.3
	Senftenberg	2	1.3		Senftenberg	4	10.0		Heidelberg	1	8.3
	IV 50:z4,z23:-	1	0.7		Agona	1	2.5		Newport	1	8.3
	Braenderup	1	0.7		Alachua	1	2.5		Orion	1	8.3
	Choleraesuis	1	0.7		Brandenburg	1	2.5		Worthington	1	8.3
	Derby	1	0.7		Bredeney	1	2.5				
	Hadar	1	0.7		Infantis	1	2.5				
	Kentucky	1	0.7		Muenchen	1	2.5				
	Mississippi	1	0.7		Schwarzengrund	1	2.5				
	Montevideo	1	0.7								
	Muenster	1	0.7								
	Paratyphi B var. L(+) tartrate+	1	0.7	**Ground Beef (N=1)**	Kentucky	1	100.0	**Cattle (N=66)**	Dublin	35	53.0
	Reading	1	0.7						Newport	10	15.2
	Saintpaul	1	0.7						Typhimurium	8	12.1
	Uganda	1	0.7						Montevideo	4	6.1
	Virchow	1	0.7						Reading	3	4.5
	Unknown serotype	8	5.3						Meleagridis	2	3.0
	Partially serotyped	1	0.7						Rough O:g,p:-	2	3.0
	Rough/Nonmotile isolates	6	3.9						Agona	1	1.5
									Infantis	1	1.5
				Pork Chops (N=4)	Typhimurium	2	50.0	**Swine (N=8)**	Typhimurium	3	37.5
					Agona	1	25.0		I 4,[5],12:i:-	2	25.0
					Saintpaul	1	25.0		Agona	1	12.5
									Bovismorfibicans	1	12.5
									Infantis	1	12.5

Table 22. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are Resistant to ≥ 5 Antimicrobial Classes, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=108)	Typhimurium	67	62.0	**Retail Chicken (N=44)**	Typhimurium	35	79.5	**Chickens (N=17)**	Kentucky	12	70.6
	Newport	10	9.3		Kentucky	6	13.6		Heidelberg	3	17.6
	Dublin	4	3.7		Mbandaka	2	4.5		Typhimurium	2	11.8
	Heidelberg	3	2.8		Hadar	1	2.3				
	Agona	2	1.9								
	Enteritidis	2	1.9								
	Senftenberg	2	1.9								
	I 4,[5],12:i:-	1	0.9								
	Braenderup	1	0.9								
	Choleraesuis	1	0.9								
	Kentucky	1	0.9	**Ground Turkey (N=31)**	Heidelberg	11	35.5	**Turkeys (N=7)**	Hadar	2	28.6
	Mississippi	1	0.9		Typhimurium	5	16.1		Schwarzengrund	2	28.6
	Montevideo	1	0.9		Hadar	4	12.9		Agona	1	14.3
	Muenster	1	0.9		Senftenberg	4	12.9		Heidelberg	1	14.3
	Oranienburg	1	0.9		Agona	1	3.2		Newport	1	14.3
	Panama	1	0.9		Alachua	1	3.2				
	Paratyphi B var. L(+) tartrate+	1	0.9		Brandenburg	1	3.2				
	Reading	1	0.9		Infantis	1	3.2				
	Unknown serotype	6	5.6		Muenchen	1	3.2				
	Rough/Nonmotile isolates	1	0.9		Saintpaul	1	3.2				
					Schwarzengrund	1	3.2				
				Ground Beef (N=1)	Kentucky	1	100.0	**Cattle (N=55)**	Dublin	27	49.1
									Newport	10	18.2
									Typhimurium	6	10.9
									Montevideo	4	7.3
									Reading	3	5.5
									Rough O:g,p:-	2	3.6
									Agona	1	1.8
									Infantis	1	1.8
									Meleagridis	1	1.8
				Pork Chops (N=3)	Typhimurium	2	66.7	**Swine (N=4)**	Typhimurium	2	50.0
					Agona	1	33.3		Agona	1	25.0
									Infantis	1	25.0

Table 23. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuT[1] Resistant, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=91)	Typhimurium	63	69.2	**Retail Chicken (N=0)**				**Chickens (N=2)**	Heidelberg	1	50.0
	Newport	10	11.0						Kentucky	1	50.0
	Dublin	4	4.4								
	I 4,[5],12:i:-	1	1.1								
	Agona	1	1.1								
	Heidelberg	1	1.1	**Ground Turkey (N=5)**	Heidelberg	3	60.0	**Turkeys (N=1)**	Schwarzengrund	1	100.0
	Montevideo	1	1.1		Infantis	1	20.0				
	Muenster	1	1.1		Senftenberg	1	20.0				
	Oranienburg	1	1.1								
	Panama	1	1.1								
	Paratyphi B var. L(+) tartrate+	1	1.1	**Ground Beef (N=0)**				**Cattle (N=43)**	Dublin	16	37.2
	Reading	1	1.1						Newport	10	23.3
	Unknown serotype	4	4.4						Typhimurium	6	14.0
	Rough/Nonmotile isolates	1	1.1						Montevideo	4	9.3
									Reading	3	7.0
									Rough O:g,p:-	2	4.7
									Infantis	1	2.3
									Meleagridis	1	2.3
				Pork Chops (N=3)	Typhimurium	2	66.7	**Swine (N=4)**	Typhimurium	2	50.0
					Agona	1	33.3		Agona	1	25.0
									Infantis	1	25.0

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

Table 24. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are at least ACT/S[1] Resistant, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=9)	Panama	2	22.2	**Retail Chicken (N=0)**				**Chickens (N=0)**			
	Typhimurium	2	22.2								
	Choleraesuis	1	11.1								
	Heidelberg	1	11.1								
	Oranienburg	1	11.1								
	Unknown serotype	1	11.1	**Ground Turkey (N=4)**	Heidelberg	3	75.0	**Turkeys (N=0)**			
	Rough/Nonmotile isolates	1	11.1		Senftenberg	1	25.0				
				Ground Beef (N=0)				**Cattle (N=5)**	Dublin	2	40.0
									Infantis	1	20.0
									Meleagridis	1	20.0
									Newport	1	20.0
				Pork Chops (N=0)				**Swine (N=0)**			

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

Table 25. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuTAuCx[1] Resistant, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=36)	Typhimurium	17	47.2	**Retail Chicken (N=0)**				**Chickens (N=2)**	Heidelberg	1	50.0
	Newport	10	27.8						Kentucky	1	50.0
	Dublin	4	11.1								
	Agona	1	2.8								
	Heidelberg	1	2.8								
	Montevideo	1	2.8	**Ground Turkey (N=5)**	Heidelberg	3	60.0	**Turkeys (N=1)**	Schwarzengrund	1	100.0
	Muenster	1	2.8		Infantis	1	20.0				
	Reading	1	2.8		Senftenberg	1	20.0				
				Ground Beef (N=0)				**Cattle (N=38)**	Dublin	12	31.6
									Newport	10	26.3
									Typhimurium	5	13.2
									Montevideo	4	10.5
									Reading	3	7.9
									Rough O:g,p:-	2	5.3
									Infantis	1	2.6
									Meleagridis	1	2.6
				Pork Chops (N=1)	Agona	1	100.0	**Swine (N=2)**	Agona	1	50.0
									Infantis	1	50.0

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

Table 26. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are at least Ceftriaxone and Nalidixic Acid Resistant, by Serotype, 2011

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (N=2)	Newport	1	50.0	**Retail Chicken (N=0)**				**Chickens (N=0)**			
	Senftenberg	1	50.0								
				Ground Turkey (N=0)				**Turkeys (N=0)**			
				Ground Beef (N=0)				**Cattle (N=3)**	Dublin	1	33.3
									Meleagridis	1	33.3
									Rough O:g,p:-	1	33.3
				Pork Chops (N=0)				**Swine (N=0)**			

Table 27a. Distribution of MICs and Occurrence of Resistance to Selected βeta-Lactam Agents among Non-Typhoidal *Salmonella* Isolates Resistant to Ceftiofur or Ceftriaxone Humans, Retail Meats, and Food Animals, 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	Humans (58)	15.5	**10.3**	[3.9 - 21.2]							1.7	5.2	15.5	39.7	12.1	5.2	10.3	**3.4**	**6.9**		
	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 Chops (2)	0.0	**0.0**	[0.0 - 84.2]										50.0	50.0						
	Chickens (31)	0.0	**0.0**	[0.0 - 11.2]							3.2	19.4	58.1	16.1	3.2						
	Turkeys (12)	0.0	**8.3**	[0.2 - 38.5]									33.3	33.3	25.0			**8.3**			
	Cattle (49)	8.1	**4.1**	[0.5 - 14.0]							6.1	8.2	32.7	32.7	8.2	2.0	6.1	**4.1**			
	Swine (2)	0.0	**0.0**	[0.0 - 84.2]									50.0	50.0							
Cephems																					
Cefepime	Humans (58)	0.0	**1.7**	[0.0 - 9.2]				3.4	32.8	41.4	13.8	5.2		1.7			**1.7**				
	Retail Chicken (54)	0.0	**0.0**	[0.0 - 6.6]			1.9	5.6	37.0	42.6	9.3	3.7									
	Ground Turkey (36)	0.0	**0.0**	[0.0 - 9.7]			8.3	8.3	27.8	41.7	11.1	2.78									
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Pork Chops (2)	0.0	**0.0**	[0.0 - 84.2]							100.0										
	Chickens (31)	0.0	**0.0**	[0.0 - 11.2]				3.2	74.2	16.1	6.5										
	Turkeys (12)	0.0	**0.0**	[0.0 - 26.5]					16.7	50.0	33.3										
	Cattle (49)	0.0	**0.0**	[0.0 - 7.3]			6.1	2.0	32.7	34.7	18.4	6.1									
	Swine (2)	0.0	**0.0**	[0.0 - 84.2]					50.0	50.0											
Cefotaxime	Humans (58)	0.0	**100.0**	[93.8 - 100.0]									**1.7**	**10.3**	**37.9**	**34.5**	**10.3**	**3.4**	**1.7**		
	Retail Chicken (54)	1.9	**96.3**	[87.3 - 99.5]				1.9				1.9	**3.7**	**9.3**	**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 Chops (2)	0.0	**100.0**	[15.8 - 100.0]												**100.0**					
	Chickens (31)	3.2	**96.8**	[83.3 - 99.9]								3.2		**22.6**	**61.3**	**12.9**					
	Turkeys (12)	0.0	**100.0**	[73.5 - 100.0]										**8.3**	**16.7**	**66.7**	**8.3**				
	Cattle (49)	0.0	**95.9**	[86.0 - 99.5]				2.0	2.0				**2.0**	**22.4**	**42.9**	**22.4**	**4.1**	**2.0**			
	Swine (2)	0.0	**100.0**	[15.8 - 100.0]											**50.0**	**50.0**					
Ceftazidime	Humans (58)	3.4	**96.6**	[88.1 - 99.6]										3.4	**22.4**	**53.4**	**12.1**	**6.9**	**1.7**		
	Retail Chicken (54)	5.6	**90.7**	[79.7 - 96.9]					1.9				1.9	5.6	**20.4**	**64.8**	**5.6**				
	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 Chops (2)	0.0	**100.0**	[15.8 - 100.0]												**50.0**	**50.0**				
	Chickens (31)	0.0	**96.8**	[83.3 - 99.9]									3.2		**58.1**	**32.3**	**6.5**				
	Turkeys (12)	0.0	**100.0**	[73.5 - 100.0]											**16.7**	**50.0**	**33.3**				
	Cattle (49)	6.1	**87.8**	[75.2 - 95.4]					2.0	2.0			2.0	6.1	**18.4**	**57.1**	**12.2**				
	Swine (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 the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 27b. Distribution of MICs and Occurrence of Resistance to Selected βeta-Lactam Agents among Non-Typhoidal Salmonella Isolates Resistant to Ceftiofur or Ceftriaxone f Humans, Retail Meats, and Food Animals, 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	0.5	1	2	4	8	16	32	64	128	256	512	1024
Monobactam																					
Aztreonam	Humans (58)	43.1	**41.4**	[28.6 - 55.1]								6.9	8.6	43.1	**27.6**	**8.6**	**5.2**				
	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 Chops (2)	0.0	**100.0**	[15.8 - 100.0]											**100.0**						
	Chickens (31)	22.6	**12.9**	[3.6 - 29.8]							3.2	19.4	41.9	22.6	**12.9**						
	Turkeys (12)	33.3	**58.3**	[27.7 - 84.8]									8.3	33.3	**58.3**						
	Cattle (49)	42.9	**24.5**	[13.3 - 38.9]				4.1		4.1	2.0	4.1	18.4	42.9	**22.4**	**2.0**					
	Swine (2)	50.0	**50.0**	[1.3 - 98.7]										50.0	**50.0**						
Penems																					
Imipenem	Humans (58)	0.0	**1.7**	[0.0 - 9.2]				1.7	77.6	19.0			**1.7**								
	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 Chops (2)	0.0	**0.0**	[0.0 - 84.2]					50.0	50.0											
	Chickens (31)	0.0	**0.0**	[0.0 - 11.2]				16.1	54.8	29.0											
	Turkeys (12)	0.0	**0.0**	[0.0 - 26.5]				16.7	50.0	33.3											
	Cattle (49)	0.0	**0.0**	[0.0 - 7.3]				26.5	26.5	44.9	2.0										
	Swine (2)	0.0	**0.0**	[0.0 - 84.2]					50.0	50.0											

[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

E. Antimicrobial Susceptibility among *Salmonella* serotype Enteritidis

Table 28a. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	319	277	337	257	271	384	412	385	441	410	513	391
		Retail Chicken			8	3	3	12	17	13	30	27	28	21
		Ground Turkey			5	1	0	0	0	0	2	0	0	1
		Ground Beef			1	1	0	0	0	0	1	0	1	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	31	21	48	42	84	173	188	124	116	118	152	134
		Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
		Cattle	4	4	6	3	2	2	2	4	5	0	1	0
		Swine	1	1	1	1	1	0	0	1	0	0	0	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.3% 1	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.8% 3	0.2% 1	0.0% 0	0.2% 1	0.0% 0	0.2% 1	0.5% 2
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	3.6% 1	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.2% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.3% 1	0.7% 2	0.3% 1	0.0% 0	0.7% 2	0.3% 1	0.2% 1	0.5% 2	0.0% 0	0.2% 1	0.2% 1	0.3% 1
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	0.0% 0
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	2.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
		Swine	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	1.4% 4	1.5% 5	1.2% 3	2.2% 6	1.0% 4	1.2% 5	0.5% 2	0.5% 2	1.2% 5	0.6% 3	1.8% 7
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	14.3% 3
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	0.0% 0
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.8% 1	0.0% 0	0.0% 0	1.3% 2	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
		Swine	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	1.4% 4	0.6% 2	0.0% 0	0.0% 0	0.8% 3	0.5% 2	0.5% 2	0.0% 0	0.0% 0	0.4% 2	0.3% 1
		Retail Chicken			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	3.6% 1	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.8% 1	0.0% 0	0.7% 1
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

Table 28b. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	319	277	337	257	271	384	412	385	441	410	513	391
		Retail Chicken			8	3	3	12	17	13	30	27	28	21
		Ground Turkey			5	1	0	0	0	0	2	0	0	1
		Ground Beef			1	1	0	0	0	0	1	0	1	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	31	21	48	42	84	173	188	124	116	118	152	134
		Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
		Cattle	4	4	6	3	2	2	2	4	5	0	1	0
		Swine	1	1	1	1	1	0	0	1	0	0	0	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	1.0% 4	0.5% 2	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.3% 1
		Retail Chicken			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	3.6% 1	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.0% 0	0.0% 0	0.7% 1
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	2.2% 6	0.0% 0	0.0% 0	0.0% 0	0.5% 2	0.5% 2	0.3% 1	0.2% 1	0.0% 0	0.0% 0	0.3% 1
		Retail Chicken			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	7.1% 2	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	1.2% 2	0.0% 0	0.0% 0	0.9% 1	0.8% 1	1.3% 2	0.7% 1
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0% 0	1.4% 4	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.5% 2	0.3% 1	0.2% 1	0.0% 0	0.0% 0	0.3% 1
		Retail Chicken			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	7.1% 2	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.8% 1	0.6% 1	0.7% 1
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Humans	0.9% 3	2.2% 6	1.5% 5	1.2% 3	1.8% 5	1.6% 6	1.5% 6	1.6% 6	1.1% 5	1.7% 7	1.9% 10	2.0% 8
		Retail Chicken			0.0% 0	0.0% 0	33.3% 1	0.0% 0	0.0% 0	0.0% 0	3.3% 1	3.7% 1	7.1% 2	9.5% 2
		Ground Turkey			0.0% 0	0.0% 0					50.0% 1			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	3.2% 1	0.0% 0	4.2% 2	2.4% 1	1.2% 1	0.0% 0	0.0% 0	0.8% 1	0.9% 1	0.0% 0	2.0% 3	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

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

Table 28c. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

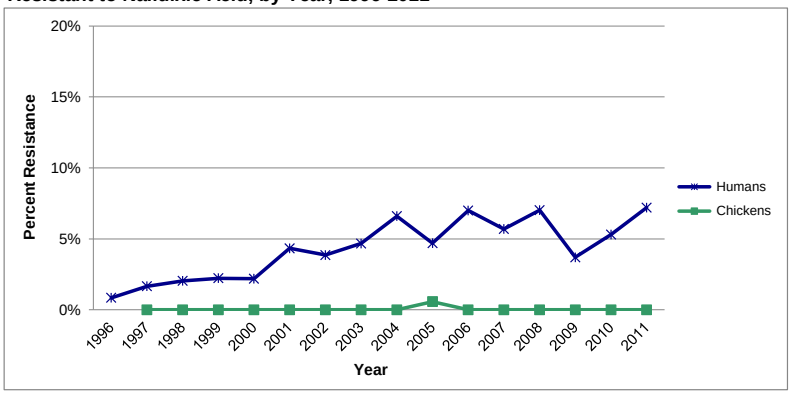
Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	319	277	337	257	271	384	412	385	441	410	513	391
		Retail Chicken			8	3	3	12	17	13	30	27	28	21
		Ground Turkey			5	1	0	0	0	0	2	0	0	1
		Ground Beef			1	1	0	0	0	0	1	0	1	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	31	21	48	42	84	173	188	124	116	118	152	134
		Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
		Cattle	4	4	6	3	2	2	2	4	5	0	1	0
		Swine	1	1	1	1	1	0	0	1	0	0	0	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0% 0	0.7% 2	0.6% 2	0.8% 2	0.0% 0	0.5% 2	0.5% 2	1.0% 4	0.9% 4	0.7% 3	1.0% 5	0.5% 2
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans												0.0% 0
		Retail Chicken												0.0% 0
		Ground Turkey												0.0% 0
		Ground Beef												
		Pork Chops												
		Chickens												0.0% 0
		Turkeys												
		Cattle												
		Swine												
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	7.5% 24	8.7% 24	6.8% 23	2.3% 6	4.1% 11	2.9% 11	4.1% 17	2.1% 8	3.9% 17	3.9% 16	2.3% 12	5.1% 20
		Retail Chicken			0.0% 0	66.7% 2	33.3% 1	0.0% 0	17.6% 3	0.0% 0	6.7% 2	18.5% 5	3.6% 1	9.5% 2
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	9.7% 3	0.0% 0	4.2% 2	0.0% 0	1.2% 1	1.2% 2	1.6% 3	1.6% 2	2.6% 3	2.5% 3	2.6% 4	1.5% 2
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
		Swine	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.5% 2	0.0% 0	0.5% 2	0.5% 2	0.0% 0	0.6% 3	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 2	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

Table 28d. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	319	277	337	257	271	384	412	385	441	410	513	391
		Retail Chicken			8	3	3	12	17	13	30	27	28	21
		Ground Turkey			5	1	0	0	0	0	2	0	0	1
		Ground Beef			1	1	0	0	0	0	1	0	1	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	31	21	48	42	84	173	188	124	116	118	152	134
		Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
		Cattle	4	4	6	3	2	2	2	4	5	0	1	0
		Swine	1	1	1	1	1	0	0	1	0	0	0	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	2.2% 7	4.3% 12	3.9% 13	4.7% 12	6.6% 18	4.7% 18	7.0% 29	5.7% 22	7.0% 31	3.7% 15	5.3% 27	7.2% 28
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	1.9% 6	1.8% 5	4.2% 14	1.6% 4	3.3% 9	2.3% 9	1.7% 7	3.9% 15	1.8% 8	1.2% 5	2.1% 11	1.8% 7
		Retail Chicken			0.0% 0	0.0% 0	33.3% 1	0.0% 0	11.8% 2	0.0% 0	3.3% 1	3.7% 1	7.1% 2	19.1% 4
		Ground Turkey			0.0% 0	0.0% 0					50.0% 1			0.0% 0
		Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	2.1% 1	2.4% 1	2.4% 2	0.6% 1	1.6% 3	2.4% 3	0.9% 1	2.5% 3	3.3% 5	0.7% 1
		Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	25.0% 1	0.0% 0		100.0% 1	
		Swine	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

Nalidixic Acid Resistance

Figure 11. Percent of *Salmonella* Enteritidis Isolates from Humans and Chickens Resistant to Nalidixic Acid, by Year, 1996-2011[1]



[1] Data for other sources are not included due to the small number of *Salmonella* Enteritidis isolates from these sources. Table 28 contains resistance data for *Salmonella* Enteritidis isolates from each source, by year

Table 29. Number of *Salmonella* Enteritidis Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	351	301	244	269	319	277	337	257	271	384	412	385	441	410	513	391
Retail Chickens							8	3	3	12	17	13	30	27	28	21
Ground Turkey							5	1	0	0	0	0	2	0	0	1
Ground Beef							1	1	0	0	0	0	1	0	1	0
Pork Chops							0	0	0	0	0	0	0	0	0	0
Chickens		1	13	41	31	21	48	42	84	173	188	124	116	118	152	134
Turkeys		0	0	1	1	0	0	0	0	0	3	0	1	0	1	0
Cattle		1	1	8	4	4	6	3	2	2	2	4	5	0	1	0
Swine		0	0	2	1	1	1	1	1	0	0	1	0	0	0	0

Table 30a. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	319	277	337	257	271	384	412	385	441	410	513	391
	Retail Chicken			8	3	3	12	17	13	30	27	28	21
	Ground Turkey			5	1	0	0	0	0	2	0	0	1
	Ground Beef			1	1	0	0	0	0	1	0	1	0
	Pork Chops			0	0	0	0	0	0	0	0	0	0
	Chickens	31	21	48	42	84	173	188	124	116	118	152	134
	Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
	Cattle	4	4	6	3	2	2	2	4	5	0	1	0
	Swine	1	1	1	1	1	0	0	1	0	0	0	0
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	89.0% 284	86.6% 240	87.5% 295	91.8% 236	86.7% 235	91.4% 351	88.8% 366	90.4% 348	87.5% 386	92.0% 377	92.0% 472	88.0% 344
	Retail Chicken			100.0% 8	33.3% 1	66.7% 2	100.0% 12	82.4% 14	100.0% 13	90.0% 27	74.1% 20	92.9% 26	81.0% 17
	Ground Turkey			100.0% 5	100.0% 1					50.0% 1			100.0% 1
	Ground Beef			100.0% 1	100.0% 1					100.0% 1		100.0% 1	
	Pork Chops												
	Chickens	90.3% 28	100.0% 21	95.8% 46	97.6% 41	97.6% 82	97.1% 168	97.9% 184	96.0% 119	97.4% 113	96.6% 114	95.4% 145	97.8% 131
	Turkeys	100.0% 1						100.0% 3		100.0% 1		100.0% 1	
	Cattle	100.0% 4	100.0% 4	100.0% 6	100.0% 3	100.0% 2	100.0% 2	50.0% 1	75.0% 3	100.0% 1		0.0% 0	
	Swine	100.0% 1	0.0% 0	100.0% 1	100.0% 1	100.0% 1			100.0% 1				
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	0.3% 1	2.9% 8	2.1% 7	0.4% 1	1.1% 3	1.6% 6	1.7% 7	1.0% 4	0.5% 2	1.0% 4	2.1% 11	2.3% 9
	Retail Chicken			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	33.3% 1	3.7% 1	7.1% 2	9.5% 2
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	3.2% 1	0.0% 0	4.2% 2	0.0% 0	2.4% 2	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.8% 1	2.6% 4	0.7% 1
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
	Swine	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	0.0% 0	1.1% 3	0.6% 2	0.4% 1	0.7% 2	1.0% 4	0.7% 3	0.3% 1	0.0% 0	0.5% 2	0.4% 2	1.3% 5
	Retail Chicken			0.0% 0	0.0% 0	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	3.6% 1	9.5% 2
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.0% 0	0.0% 0	0.0% 0	0.9% 1	0.8% 1	0.6% 1	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	0.0% 0	0.4% 1	0.0% 0	0.4% 1	0.7% 2	0.5% 2	0.2% 1	0.3% 1	0.0% 0	0.2% 1	0.0% 0	0.5% 2
	Retail Chicken			0.0% 0	0.0% 0	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	3.6% 1	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	4.2% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.9% 1	0.0% 0	0.6% 1	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

Table 30b. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	319	277	337	257	271	384	412	385	441	410	513	391
	Retail Chicken			8	3	3	12	17	13	30	27	28	21
	Ground Turkey			5	1	0	0	0	0	2	0	0	1
	Ground Beef			1	1	0	0	0	0	1	0	1	0
	Pork Chops			0	0	0	0	0	0	0	0	0	0
	Chickens	31	21	48	42	84	173	188	124	116	118	152	134
	Turkeys	1	0	0	0	0	0	3	0	1	0	1	0
	Cattle	4	4	6	3	2	2	2	4	5	0	1	0
	Swine	1	1	1	1	1	0	0	1	0	0	0	0
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[1] Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.4% 1	0.5% 2	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 1	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
6. At Least ACT/S[2] Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
7. At Least ACSSuTAuCx[3] Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.2% 1	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0
	Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0						0.0% 0		0.0% 0		0.0% 0	
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0				

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
[2] ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
[3] ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

F. Antimicrobial Susceptibility among *Salmonella* serotype Typhimurium

Table 31a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	304	325	394	408	382	438	408	405	397	370	359	323
		Retail Chicken			9	22	49	29	21	25	68	122	79	66
		Ground Turkey			2	2	2	1	0	1	1	1	6	8
		Ground Beef			2	1	0	0	1	3	2	0	0	0
		Pork Chops			2	1	2	2	2	3	3	1	5	7
		Chickens	145	130	150	156	171	183	105	83	70	36	54	30
		Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
		Cattle	187	87	98	78	48	34	22	26	28	18	15	14
		Swine	81	44	48	27	53	42	25	44	10	20	13	5
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	2.6% 8	1.5% 5	2.3% 9	2.0% 8	2.1% 8	1.8% 8	2.7% 11	2.5% 10	1.5% 6	1.9% 7	0.8% 3	2.2% 7
		Retail Chicken			0.0% 0	0.0% 0	2.0% 1	0.0% 0	0.0% 0	0.0% 0	1.5% 1	2.5% 3	6.3% 5	3.0% 2
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	15.2% 22	3.1% 4	12.7% 19	5.1% 8	4.1% 7	4.4% 8	6.7% 7	3.6% 3	5.7% 4	0.0% 0	5.6% 3	6.7% 2
		Turkeys	33.3% 6	53.3% 8	44.4% 4	83.3% 5	64.3% 9	14.3% 1	20.0% 1	16.7% 1	33.3% 1	50.0% 1	0.0% 0	0.0% 0
		Cattle	1.6% 3	0.0% 0	2.0% 2	1.3% 1	0.0% 0	0.0% 0	0.0% 0	7.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	2.3% 1	2.1% 1	0.0% 0	3.8% 2	7.1% 3	8.0% 2	2.3% 1	10.0% 1	0.0% 0	7.7% 1	0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	13.2% 40	8.3% 27	7.6% 30	7.1% 29	5.8% 22	5.7% 25	5.1% 21	5.9% 24	2.5% 10	4.9% 18	7.2% 26	4.0% 13
		Retail Chicken			0.0% 0	18.2% 4	34.7% 17	24.1% 7	47.6% 10	12.0% 3	25.0% 17	27.9% 34	10.1% 8	24.2% 16
		Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 2	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0
		Chickens	3.4% 5	3.1% 4	5.3% 8	7.7% 12	9.9% 17	7.7% 14	18.1% 19	7.2% 6	8.6% 6	8.3% 3	16.7% 9	0.0% 0
		Turkeys	44.4% 8	73.3% 11	55.6% 5	50.0% 3	21.4% 3	0.0% 0	0.0% 0	16.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	27.3% 51	24.1% 21	26.5% 26	16.7% 13	14.6% 7	38.2% 13	13.6% 3	26.9% 7	14.3% 4	33.3% 6	13.3% 2	14.3% 2
		Swine	14.8% 12	13.6% 6	2.1% 1	0.0% 0	9.4% 5	7.1% 3	16.0% 4	9.1% 4	10.0% 1	0.0% 0	15.4% 2	20.0% 1
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	39.5% 120	40.0% 130	32.0% 126	35.5% 145	31.9% 122	28.1% 123	29.4% 120	32.3% 131	28.7% 114	25.9% 96	25.6% 92	25.7% 83
		Retail Chicken			0.0% 0	18.2% 4	14.3% 7	3.4% 1	9.5% 2	28.0% 7	16.2% 11	15.6% 19	22.8% 18	24.2% 16
		Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	33.3% 2	50.0% 4
		Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
		Pork Chops			50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2	0.0% 0	33.3% 1	100.0% 1	80.0% 4	71.4% 5
		Chickens	35.9% 52	16.9% 22	30.0% 45	16.7% 26	8.2% 14	13.7% 25	17.1% 18	10.8% 9	5.7% 4	5.6% 2	14.8% 8	6.7% 2
		Turkeys	72.2% 13	93.3% 14	77.8% 7	100.0% 6	64.3% 9	57.1% 4	60.0% 3	50.0% 3	33.3% 1	100.0% 2	50.0% 2	0.0% 0
		Cattle	63.1% 118	46.0% 40	66.3% 65	52.6% 41	56.3% 27	55.9% 19	54.5% 12	50.0% 13	50.0% 14	72.2% 13	53.3% 8	57.1% 8
		Swine	77.8% 63	70.5% 31	77.1% 37	59.3% 16	77.4% 41	69.0% 29	72.0% 18	59.1% 26	80.0% 8	80.0% 16	61.5% 8	80.0% 4
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	6.3% 19	6.2% 20	7.6% 30	5.6% 23	4.7% 18	3.2% 14	4.4% 18	6.7% 27	3.5% 14	6.2% 23	4.2% 15	6.8% 22
		Retail Chicken			33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	48.5% 33	57.4% 70	60.8% 48	54.6% 36
		Ground Turkey			0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	62.5% 5
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	25.5% 37	14.6% 19	28.7% 43	25.6% 40	43.3% 74	19.7% 36	30.5% 32	33.7% 28	24.3% 17	33.3% 12	29.6% 16	6.7% 2
		Turkeys	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	50.0% 2	0.0% 0
		Cattle	12.8% 24	13.8% 12	17.3% 17	20.5% 16	25.0% 12	35.3% 12	27.3% 6	26.9% 7	21.4% 6	27.8% 5	20.0% 3	35.7% 5
		Swine	2.5% 2	4.5% 2	8.3% 4	0.0% 0	0.0% 0	9.5% 4	0.0% 0	2.3% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0

Table 31b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	304	325	394	408	382	438	408	405	397	370	359	323
		Retail Chicken			9	22	49	29	21	25	68	122	79	66
		Ground Turkey			2	2	2	1	0	1	1	1	6	8
		Ground Beef			2	1	0	0	1	3	2	0	0	0
		Pork Chops			2	1	2	2	2	3	3	1	5	7
		Chickens	145	130	150	156	171	183	105	83	70	36	54	30
		Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
		Cattle	187	87	98	78	48	34	22	26	28	18	15	14
		Swine	81	44	48	27	53	42	25	44	10	20	13	5
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	3.6% 11	3.1% 10	4.3% 17	4.4% 18	4.7% 18	2.5% 11	3.9% 16	5.7% 23	3.5% 14	5.4% 20	3.3% 12	6.8% 22
		Retail Chicken			33.3% 3	63.6% 14	49.0% 24	51.7% 15	52.4% 11	40.0% 10	45.6% 31	47.5% 58	49.4% 39	34.9% 23
		Ground Turkey			0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	50.0% 4
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	24.8% 36	14.6% 19	26.7% 40	23.7% 37	43.3% 74	19.7% 36	29.5% 31	24.1% 20	20.0% 14	27.8% 10	27.8% 15	6.7% 2
		Turkeys	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	0.0% 0	0.0% 0
		Cattle	9.1% 17	11.5% 10	11.2% 11	16.7% 13	25.0% 12	35.3% 12	27.3% 6	26.9% 7	17.9% 5	22.2% 4	20.0% 3	35.7% 5
		Swine	1.2% 1	0.0% 0	4.2% 2	3.7% 1	0.0% 0	4.8% 2	0.0% 0	4.5% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	3.6% 11	3.1% 10	4.3% 17	4.9% 20	4.5% 17	2.5% 11	4.2% 17	6.4% 26	3.5% 14	6.5% 24	4.7% 17	6.8% 22
		Retail Chicken			33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	48.5% 33	56.6% 69	60.8% 48	54.6% 36
		Ground Turkey			0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	50.0% 4
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	26.2% 38	14.6% 19	28.0% 42	25.6% 40	43.3% 74	19.7% 36	30.5% 32	32.5% 27	24.3% 17	33.3% 12	29.6% 16	6.7% 2
		Turkeys	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	0.0% 0	0.0% 0
		Cattle	11.8% 22	11.5% 10	15.3% 15	20.5% 16	25.0% 12	35.3% 12	27.3% 6	26.9% 7	21.4% 6	27.8% 5	20.0% 3	35.7% 5
		Swine	0.0% 0	0.0% 0	4.2% 2	0.0% 0	1.9% 1	4.8% 2	0.0% 0	2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	3.3% 10	3.1% 10	4.3% 17	4.9% 20	4.5% 17	2.5% 11	4.2% 17	6.4% 26	3.5% 14	6.5% 24	4.7% 17	6.8% 22
		Retail Chicken			33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	48.5% 33	57.3% 70	60.8% 48	54.6% 36
		Ground Turkey			0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	62.5% 5
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	26.2% 38	14.6% 19	26.7% 40	25.6% 40	43.3% 74	19.7% 36	30.5% 32	33.7% 28	24.3% 17	33.3% 12	29.6% 16	6.7% 2
		Turkeys	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	0.0% 0	0.0% 0
		Cattle	11.8% 22	11.5% 10	15.3% 15	20.5% 16	25.0% 12	35.3% 12	27.3% 6	26.9% 7	21.4% 6	27.8% 5	20.0% 3	35.7% 5
		Swine	0.0% 0	0.0% 0	4.2% 2	0.0% 0	0.0% 0	4.8% 2	0.0% 0	2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Humans	45.4% 138	43.1% 140	32.2% 127	38.7% 158	36.1% 138	32.0% 140	33.3% 136	37.3% 151	30.5% 121	30.0% 111	28.7% 103	27.2% 88
		Retail Chicken			44.4% 4	31.8% 7	73.5% 36	69.0% 20	90.5% 19	68.0% 17	94.1% 64	96.7% 118	92.4% 73	93.9% 62
		Ground Turkey			0.0% 0	50.0% 1	100.0% 2	0.0% 0		100.0% 1	0.0% 0	100.0% 1	66.7% 4	62.5% 5
		Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
		Pork Chops			50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2	0.0% 0	33.3% 1	100.0% 1	80.0% 4	71.4% 5
		Chickens	34.5% 50	18.5% 24	31.3% 47	28.2% 44	47.4% 81	37.2% 68	65.7% 69	60.2% 50	70.0% 49	52.8% 19	74.1% 40	70.0% 21
		Turkeys	66.7% 12	86.7% 13	77.8% 7	100.0% 6	78.6% 11	57.1% 4	80.0% 4	83.3% 5	66.7% 2	100.0% 2	50.0% 2	0.0% 0
		Cattle	64.2% 120	54.0% 47	58.2% 57	44.9% 35	60.4% 29	73.5% 25	59.1% 13	65.4% 17	53.6% 15	83.3% 15	60.0% 9	57.1% 8
		Swine	86.4% 70	75.0% 33	68.8% 33	63.0% 17	81.1% 43	69.0% 29	96.0% 24	77.3% 34	80.0% 8	90.0% 18	69.2% 9	80.0% 4

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

Table 31c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

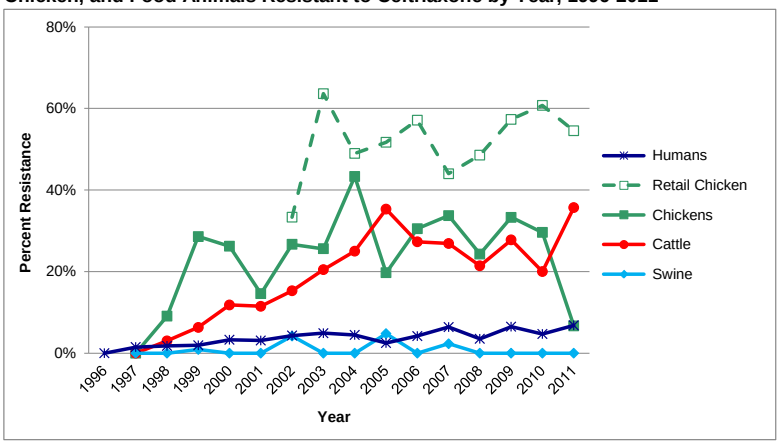
Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	304	325	394	408	382	438	408	405	397	370	359	323
		Retail Chicken			9	22	49	29	21	25	68	122	79	66
		Ground Turkey			2	2	2	1	0	1	1	1	6	8
		Ground Beef			2	1	0	0	1	3	2	0	0	0
		Pork Chops			2	1	2	2	2	3	3	1	5	7
		Chickens	145	130	150	156	171	183	105	83	70	36	54	30
		Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
		Cattle	187	87	98	78	48	34	22	26	28	18	15	14
		Swine	81	44	48	27	53	42	25	44	10	20	13	5
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	3.6% 11	2.5% 8	2.3% 9	3.4% 14	2.6% 10	2.7% 12	2.2% 9	2.5% 10	1.8% 7	3.0% 11	1.9% 7	1.9% 6
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0
		Chickens	0.0% 0	0.8% 1	1.3% 2	0.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.8% 1	0.0% 0	0.0% 0
		Turkeys	11.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	2.1% 4	2.3% 2	4.1% 4	2.6% 2	4.2% 2	5.9% 2	4.5% 1	0.0% 0	0.0% 0	5.6% 1	6.7% 1	0.0% 0
		Swine	0.0% 0	0.0% 0	2.1% 1	3.7% 1	1.9% 1	9.5% 4	4.0% 1	9.1% 4	10.0% 1	5.0% 1	7.7% 1	0.0% 0
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans												0.0% 0
		Retail Chicken												0.0% 0
		Ground Turkey												0.0% 0
		Ground Beef												
		Pork Chops												
		Chickens												0.0% 0
		Turkeys												0.0% 0
		Cattle												0.0% 0
		Swine												0.0% 0
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	42.1% 128	42.5% 138	33.8% 133	36.3% 148	32.2% 123	29.0% 127	28.2% 115	31.6% 128	26.4% 105	28.1% 104	26.2% 94	25.7% 83
		Retail Chicken			33.3% 3	72.7% 16	53.1% 26	55.2% 16	57.1% 12	48.0% 12	60.3% 41	68.0% 83	69.6% 55	66.7% 44
		Ground Turkey			0.0% 0	100.0% 2	50.0% 1	100.0% 1		100.0% 1	0.0% 0	0.0% 0	66.7% 4	87.5% 7
		Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
		Pork Chops			50.0% 1	100.0% 1	50.0% 1	5.6% 2	100.0% 2	0.0% 0	0.0% 0	100.0% 1	20.0% 1	28.6% 2
		Chickens	42.1% 61	26.2% 34	45.3% 68	32.1% 50	46.8% 80	26.8% 49	42.9% 45	37.3% 31	28.6% 20	33.3% 12	35.2% 19	10.0% 3
		Turkeys	66.7% 12	80.0% 12	55.6% 5	66.7% 4	28.6% 4	57.1% 4	80.0% 4	83.3% 5	33.3% 1	50.0% 1	50.0% 2	0.0% 0
		Cattle	63.1% 118	57.5% 50	71.4% 70	59.0% 46	60.4% 29	73.5% 25	63.6% 14	61.5% 16	50.0% 14	83.3% 15	53.3% 8	57.1% 8
		Swine	82.7% 67	63.6% 28	62.5% 30	51.9% 14	71.7% 38	66.7% 28	76.0% 19	70.5% 31	70.0% 7	80.0% 16	53.8% 7	60.0% 3
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	30.9% 94	31.7% 103	23.4% 92	28.2% 115	24.3% 93	24.4% 107	22.1% 90	25.4% 103	23.4% 93	20.5% 76	20.3% 73	19.5% 63
		Retail Chicken			0.0% 0	9.1% 2	4.1% 2	3.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.1% 4	0.0% 0
		Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	16.7% 1	0.0% 0
		Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
		Pork Chops			50.0% 1	100.0% 1	100.0% 2	100.0% 2	0.0% 0	0.0% 0	0.0% 0	100.0% 1	60.0% 3	28.6% 2
		Chickens	14.5% 21	11.5% 15	16.0% 24	5.1% 8	1.8% 3	8.2% 15	7.6% 8	1.2% 1	1.4% 1	0.0% 0	3.7% 2	0.0% 0
		Turkeys	55.6% 10	73.3% 11	66.7% 6	50.0% 3	28.6% 4	57.1% 4	60.0% 3	66.7% 4	33.3% 1	0.0% 0	50.0% 2	0.0% 0
		Cattle	42.8% 80	37.9% 33	49.0% 48	42.3% 33	54.2% 26	47.1% 16	50.0% 11	65.4% 17	35.7% 10	66.7% 12	46.7% 7	42.9% 6
		Swine	53.1% 43	47.7% 21	56.3% 27	48.1% 13	60.4% 32	54.8% 23	64.0% 16	65.9% 29	50.0% 5	75.0% 15	46.2% 6	40.0% 2

Table 31d. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	304	325	394	408	382	438	408	405	397	370	359	323
		Retail Chicken			9	22	49	29	21	25	68	122	79	66
		Ground Turkey			2	2	2	1	0	1	1	1	6	8
		Ground Beef			2	1	0	0	1	3	2	0	0	0
		Pork Chops			2	1	2	2	2	3	3	1	5	7
		Chickens	145	130	150	156	171	183	105	83	70	36	54	30
		Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
		Cattle	187	87	98	78	48	34	22	26	28	18	15	14
		Swine	81	44	48	27	53	42	25	44	10	20	13	5
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.2% 1	0.0% 0	0.0% 0	0.8% 3	0.0% 0	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	0.0% 0	0.0% 0	0.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	1.3% 4	0.6% 2	1.3% 5	1.2% 5	0.5% 2	0.9% 4	0.7% 3	1.5% 6	1.3% 5	2.2% 8	1.4% 5	0.3% 1
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	0.7% 1	0.0% 0	2.7% 4	0.0% 0	0.0% 0	1.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	33.3% 6	60.0% 9	55.6% 5	33.3% 2	14.3% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	1.0% 1	0.0% 0	6.3% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	1.2% 1	0.0% 0	2.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	43.4% 132	43.4% 141	32.0% 126	38.0% 155	30.3% 116	30.4% 133	31.6% 129	36.8% 149	27.7% 110	28.9% 107	29.0% 104	27.2% 88
		Retail Chicken			44.4% 4	31.8% 7	71.4% 35	69.0% 20	90.5% 19	72.0% 18	92.6% 63	95.9% 117	88.6% 70	92.4% 61
		Ground Turkey			0.0% 0	50.0% 1	100.0% 2	0.0% 0		100.0% 1	0.0% 0	100.0% 1	66.7% 4	87.5% 7
		Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
		Pork Chops			100.0% 2	100.0% 1	100.0% 2	100.0% 2	100.0% 2	66.7% 2	33.3% 1	100.0% 1	60.0% 3	57.1% 4
		Chickens	32.4% 47	16.2% 21	28.0% 42	33.3% 52	44.4% 76	34.4% 63	61.0% 64	60.2% 50	64.3% 45	55.6% 20	72.2% 39	66.7% 20
		Turkeys	83.3% 15	93.3% 14	77.8% 7	100.0% 6	78.6% 11	57.1% 4	100.0% 5	66.7% 4	66.7% 2	50.0% 1	50.0% 2	0.0% 0
		Cattle	61.5% 115	44.8% 39	64.3% 63	53.8% 42	60.4% 29	67.6% 23	54.5% 12	65.4% 17	50.0% 14	88.9% 16	60.0% 9	57.1% 8
		Swine	90.1% 73	79.5% 35	89.6% 43	74.1% 20	90.6% 48	83.3% 35	96.0% 24	88.6% 39	100.0% 10	100.0% 20	76.9% 10	80.0% 4

Ceftriaxone Resistance

Figure 12. Percent of *Salmonella* Typhimurium Isolates from Humans, Retail Chicken, and Food Animals Resistant to Ceftriaxone by Year, 1996-2011[1]



[1] Data for ground turkey, ground beef, pork chops, and turkeys are not included due to the small number of *Salmonella* Typhimurium isolates from these sources. Table 31 contains resistance data for *Salmonella* Typhimurium isolates from each source, by year

Table 32. Number of *Salmonella* Typhimurium Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	307	328	381	363	304	325	394	408	382	438	408	405	397	370	359	323
Retail Chickens							9	22	49	29	21	25	68	122	79	66
Ground Turkey							2	2	2	1	0	1	1	1	6	8
Ground Beef							2	1	0	0	1	3	2	0	0	0
Pork Chops							2	1	2	2	2	3	3	1	5	7
Chickens		24	66	154	145	130	150	156	171	183	105	83	70	36	54	30
Turkeys		4	6	37	18	15	9	6	14	7	5	6	3	2	4	2
Cattle		1	33	189	187	87	98	78	48	34	22	26	28	18	15	14
Swine		25	104	114	81	44	48	27	53	42	25	44	10	20	13	5

Table 33a. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	304	325	394	408	382	438	408	405	397	370	359	323
	Retail Chicken			9	22	49	29	21	25	68	122	79	66
	Ground Turkey			2	2	2	1	0	1	1	1	6	8
	Ground Beef			2	1	0	0	1	3	2	0	0	0
	Pork Chops			2	1	2	2	2	3	3	1	5	7
	Chickens	145	130	150	156	171	183	105	83	70	36	54	30
	Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
	Cattle	187	87	98	78	48	34	22	26	28	18	15	14
	Swine	81	44	48	27	53	42	25	44	10	20	13	5
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	49.3% 150	49.2% 160	59.9% 236	54.7% 223	60.5% 231	65.1% 285	62.5% 255	57.5% 233	67.8% 269	63.5% 235	66.9% 240	69.0% 223
	Retail Chicken			22.2% 2	22.7% 5	14.3% 7	24.1% 7	0.0% 0	24.0% 6	5.9% 4	2.5% 3	3.8% 3	4.6% 3
	Ground Turkey			100.0% 2	0.0% 0	0.0% 0	0.0% 0		0.0% 0	100.0% 1	0.0% 0	33.3% 2	12.5% 1
	Ground Beef			100.0% 2	100.0% 1			0.0% 0	100.0% 3	50.0% 1			
	Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	33.3% 1	66.7% 2	0.0% 0	0.0% 0	28.6% 2
	Chickens	31.7% 46	64.6% 84	37.3% 56	45.5% 71	40.9% 70	54.1% 99	30.5% 32	30.1% 25	27.1% 19	33.3% 12	22.2% 12	30.0% 9
	Turkeys	5.6% 1	6.7% 1	0.0% 0	0.0% 0	14.3% 2	42.9% 3	0.0% 0	16.7% 1	0.0% 0	0.0% 0	50.0% 2	100.0% 2
	Cattle	26.7% 50	34.5% 30	19.4% 19	39.7% 31	35.4% 17	26.5% 9	31.8% 7	34.6% 9	46.4% 13	5.5% 1	40.0% 6	42.9% 6
	Swine	2.5% 2	13.6% 6	8.3% 4	18.5% 5	3.8% 2	16.7% 7	0.0% 0	6.8% 3	0.0% 0	0.0% 0	23.1% 3	0.0% 0
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	43.4% 132	41.5% 135	32.5% 128	37.3% 152	31.7% 121	30.1% 132	30.4% 124	34.3% 139	28.0% 111	28.1% 104	27.3% 98	26.3% 85
	Retail Chicken			33.3% 3	72.7% 16	71.4% 35	58.6% 17	81.0% 17	68.0% 17	77.9% 53	75.4% 92	75.9% 60	71.2% 47
	Ground Turkey			0.0% 0	100.0% 2	100.0% 2	100.0% 1		100.0% 1	0.0% 0	0.0% 0	66.7% 4	87.5% 7
	Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
	Pork Chops			50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2	0.0% 0	33.3% 1	100.0% 1	80.0% 4	57.1% 4
	Chickens	48.3% 70	28.5% 37	46.0% 69	34.6% 54	48.5% 83	30.6% 56	55.2% 58	39.8% 33	31.4% 22	38.9% 14	44.4% 24	16.7% 5
	Turkeys	66.7% 12	86.7% 13	77.8% 7	100.0% 6	71.4% 10	57.1% 4	80.0% 4	83.3% 5	33.3% 1	50.0% 1	50.0% 2	0.0% 0
	Cattle	64.2% 120	50.6% 44	70.4% 69	59.0% 46	60.4% 29	73.5% 25	59.1% 13	65.4% 17	50.0% 14	83.3% 15	53.3% 8	57.1% 8
	Swine	86.4% 70	70.5% 31	75.0% 36	55.6% 15	77.4% 41	71.4% 30	96.0% 24	72.7% 32	80.0% 8	85.0% 17	61.5% 8	60.0% 3
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	39.8% 121	37.8% 123	28.4% 112	32.4% 132	27.7% 106	27.4% 120	27.0% 110	29.9% 121	24.9% 99	24.1% 89	24.2% 87	21.7% 70
	Retail Chicken			0.0% 0	36.4% 8	46.9% 23	48.3% 14	47.6% 10	40.0% 10	54.4% 37	60.7% 74	63.3% 50	59.1% 39
	Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	66.7% 4	62.5% 5
	Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
	Pork Chops			50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2	0.0% 0	0.0% 0	100.0% 1	20.0% 1	28.6% 2
	Chickens	20.7% 30	13.1% 17	25.3% 38	19.9% 31	37.4% 64	21.3% 39	38.1% 40	31.3% 26	25.7% 18	25.0% 9	31.5% 17	6.7% 2
	Turkeys	61.1% 11	86.7% 13	66.7% 6	66.7% 4	28.6% 4	57.1% 4	60.0% 3	66.7% 4	33.3% 1	50.0% 1	50.0% 2	0.0% 0
	Cattle	55.6% 104	41.4% 36	58.2% 57	51.3% 40	60.4% 29	64.7% 22	54.5% 12	61.5% 16	46.4% 13	77.8% 14	53.3% 8	57.1% 8
	Swine	74.1% 60	54.5% 24	60.4% 29	51.9% 14	71.7% 38	66.7% 28	72.0% 18	70.5% 31	70.0% 7	75.0% 15	53.8% 7	60.0% 3
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	29.6% 90	29.5% 96	23.1% 91	27.7% 113	24.3% 93	22.8% 100	20.8% 85	24.9% 101	23.9% 95	22.2% 82	20.9% 75	20.7% 67
	Retail Chicken			0.0% 0	27.3% 6	44.9% 22	48.3% 14	47.6% 10	40.0% 10	47.1% 32	56.6% 69	54.5% 47	53.0% 35
	Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	66.7% 4	62.5% 5
	Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
	Pork Chops			50.0% 1	100.0% 1	50.0% 1	100.0% 2	0.0% 0	0.0% 0	0.0% 0	100.0% 1	20.0% 1	28.6% 2
	Chickens	17.2% 25	12.3% 16	20.0% 30	17.3% 27	36.3% 62	19.7% 36	35.2% 37	30.1% 25	22.8% 16	25.9% 9	29.6% 16	6.7% 2
	Turkeys	55.6% 10	73.3% 11	55.6% 5	50.0% 3	28.6% 4	57.1% 4	60.0% 3	33.3% 2	33.3% 1	50.0% 1	50.0% 2	0.0% 0
	Cattle	38.0% 71	34.5% 30	35.7% 35	33.3% 26	58.3% 28	50.0% 17	50.0% 11	61.5% 16	35.7% 10	72.2% 13	46.7% 7	42.9% 6
	Swine	43.2% 35	45.5% 20	47.9% 23	48.1% 13	60.4% 32	54.8% 23	44.0% 11	47.7% 21	40.0% 4	70.0% 14	46.2% 6	40.0% 2

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

Table 33b. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	304	325	394	408	382	438	408	405	397	370	359	323
	Retail Chicken			9	22	49	29	21	25	68	122	79	66
	Ground Turkey			2	2	2	1	0	1	1	1	6	8
	Ground Beef			2	1	0	0	1	3	2	0	0	0
	Pork Chops			2	1	2	2	2	3	3	1	5	7
	Chickens	145	130	150	156	171	183	105	83	70	36	54	30
	Turkeys	18	15	9	6	14	7	5	6	3	2	4	2
	Cattle	187	87	98	78	48	34	22	26	28	18	15	14
	Swine	81	44	48	27	53	42	25	44	10	20	13	5
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[1] Resistant	Humans	28.0% 85	29.5% 96	21.6% 85	26.5% 108	23.6% 90	22.4% 98	19.6% 80	22.7% 92	23.2% 92	19.5% 72	18.7% 67	19.5% 63
	Retail Chicken			0.0% 0	9.1% 2	4.1% 2	3.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.5% 2	0.0% 0
	Ground Turkey			0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	16.7% 1	0.0% 0
	Ground Beef			0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1			
	Pork Chops			50.0% 1	100.0% 1	50.0% 1	100.0% 2	0.0% 0	0.0% 0	0.0% 0	100.0% 1	20.0% 1	28.6% 2
	Chickens	13.1% 19	11.5% 15	12.7% 19	3.2% 5	1.8% 3	7.1% 13	6.7% 7	1.2% 1	0.0% 0	0.0% 0	13.0% 7	0.0% 0
	Turkeys	50.0% 9	66.7% 10	44.4% 4	50.0% 3	28.6% 4	57.1% 4	60.0% 3	33.3% 2	33.3% 1	0.0% 0	50.0% 2	0.0% 0
	Cattle	37.4% 70	31.0% 27	31.6% 31	28.2% 22	54.2% 26	41.2% 14	50.0% 11	50.0% 13	35.7% 10	66.7% 12	46.7% 7	42.9% 6
	Swine	39.5% 32	45.5% 20	47.9% 23	44.4% 12	60.4% 32	50.0% 21	44.0% 11	47.7% 21	30.0% 3	70.0% 14	15.4% 2	40.0% 2
6. At Least ACT/S[2] Resistant	Humans	1.6% 5	0.9% 3	2.0% 8	3.2% 13	1.6% 6	2.1% 9	0.7% 3	2.0% 8	0.5% 2	2.2% 8	1.1% 4	0.6% 2
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
	Pork Chops			0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.5% 1	2.3% 2	3.1% 3	2.6% 2	4.2% 2	2.9% 1	4.5% 1	0.0% 0	0.0% 0	5.6% 1	6.7% 1	0.0% 0
	Swine	0.0% 0	0.0% 0	2.1% 1	0.0% 0	1.9% 1	7.1% 3	4.0% 1	9.1% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0
7. At Least ACSSuTAuCx[3] Resistant	Humans	1.6% 5	1.2% 4	1.8% 7	2.2% 9	2.6% 10	1.8% 8	2.9% 12	3.7% 15	2.3% 9	1.6% 6	1.7% 6	5.3% 17
	Retail Chicken			0.0% 0	0.0% 0	4.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
	Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Chickens	0.7% 1	0.0% 0	2.0% 3	0.6% 1	0.0% 0	1.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.9% 1	0.0% 0
	Turkeys	33.3% 6	53.3% 8	11.1% 1	16.7% 1	14.2% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	11.8% 22	10.3% 9	11.2% 11	12.8% 10	20.8% 10	26.5% 9	22.7% 5	26.9% 7	21.4% 6	16.7% 3	20.0% 3	35.7% 5
	Swine	0.0% 0	0.0% 0	4.2% 2	0.0% 0	0.0% 0	2.4% 1	0.0% 0	2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.3% 1	0.3% 1	0.5% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.5% 2	0.3% 1	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef			0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0			
	Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Chickens	0.7% 1	0.0% 0	2.7% 4	0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	33.3% 6	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	4.2% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Swine	0.0% 0	0.0% 0	2.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

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

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

G. Antimicrobial Susceptibility among *Salmonella* serotype Newport

Table 34a. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	122	126	244	226	191	207	218	222	258	238	305	285
		Retail Chicken			2	0	0	0	0	0	0	1	0	0
		Ground Turkey			1	2	2	3	0	0	3	3	2	0
		Ground Beef			3	1	2	0	0	0	3	2	2	0
		Pork Chops			2	1	0	0	0	0	0	0	0	0
		Chickens	5	8	6	7	0	6	0	3	1	0	1	1
		Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
		Cattle	109	87	113	75	44	27	30	30	31	17	5	13
		Swine	2	7	0	3	0	1	1	1	2	0	0	1
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16)	Humans	2.5% 3	3.2% 4	3.3% 8	3.1% 7	0.5% 1	1.0% 2	0.9% 2	0.9% 2	0.4% 1	0.4% 1	0.3% 1	0.7% 2
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			0.0% 0	50.0% 1	0.0% 0	0.0% 0			33.3% 1	33.3% 1	50.0% 1	
		Ground Beef			0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0	
		Pork Chops			0.0% 0	0.0% 0								
		Chickens	20.0% 1	0.0% 0	0.0% 0	0.0% 0		16.7% 1		0.0% 0	0.0% 0		0.0% 0	0.0% 0
		Turkeys	16.7% 1	6.3% 1	0.0% 0	52.6% 10	14.3% 1	80.0% 4	50.0% 2	0.0% 0	25.0% 2	66.7% 2	0.0% 0	0.0% 0
		Cattle	11.0% 12	6.9% 6	7.1% 8	1.3% 1	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
	Kanamycin (MIC ≥ 64)	Humans	4.9% 6	7.1% 9	9.8% 24	4.4% 10	2.6% 5	1.9% 4	2.3% 5	0.9% 2	3.5% 9	1.7% 4	0.7% 2	0.4% 1
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			0.0% 0	0.0% 0	0.0% 0				33.3% 1	0.0% 0	50.0% 1	
		Pork Chops			0.0% 0	0.0% 0								
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 2		0.0% 0	0.0% 0		0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	10.0% 1	21.1% 4	14.3% 1	80.0% 4	50.0% 2	6.7% 1	37.5% 3	33.3% 1	20.0% 1	25.0% 1
		Cattle	9.2% 10	6.9% 6	15.9% 18	17.3% 13	25.0% 11	14.8% 4	13.3% 4	10.0% 3	0.0% 0	5.9% 1	0.0% 0	7.7% 1
		Swine	0.0% 0	57.1% 4		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
	Streptomycin (MIC ≥ 64)	Humans	23.8% 29	31.0% 39	25.0% 61	24.3% 55	15.7% 30	14.0% 29	13.8% 30	10.4% 23	13.6% 35	8.4% 20	8.2% 25	4.2% 12
		Retail Chicken			100.0% 2							0.0% 0		
		Ground Turkey			100.0% 1	50.0% 1	0.0% 0	0.0% 0			33.3% 1	33.3% 1	50.0% 1	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	20.0% 1	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	16.7% 1	12.5% 2	0.0% 0	31.6% 6	14.3% 1	80.0% 4	0.0% 0	6.7% 1	25.0% 2	66.7% 2	0.0% 0	0.0% 0
		Cattle	79.8% 87	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10
		Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	22.1% 27	26.2% 33	22.5% 55	21.7% 49	15.2% 29	12.6% 26	12.4% 27	8.1% 18	12.4% 32	7.6% 18	7.5% 23	3.9% 11
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
		Cattle	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10
		Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0

Table 34b. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	122	126	244	226	191	207	218	222	258	238	305	285
		Retail Chicken			2	0	0	0	0	0	0	1	0	0
		Ground Turkey			1	2	2	3	0	0	3	3	2	0
		Ground Beef			3	1	2	0	0	0	3	2	2	0
		Pork Chops			2	1	0	0	0	0	0	0	0	0
		Chickens	5	8	6	7	0	6	0	3	1	0	1	1
		Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
		Cattle	109	87	113	75	44	27	30	30	31	17	5	13
		Swine	2	7	0	3	0	1	1	1	2	0	0	1
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	22.1% 27	25.4% 32	22.1% 54	21.7% 49	15.2% 29	12.6% 26	12.8% 28	8.1% 18	12.4% 32	6.7% 16	7.2% 22	3.9% 11
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
		Cattle	73.4% 80	66.7% 58	77.9% 88	74.7% 56	77.3% 34	81.5% 22	70.0% 21	76.7% 23	64.5% 20	52.9% 6	60.0% 3	76.9% 10
		Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	22.1% 27	27.0% 34	22.5% 55	22.1% 50	15.2% 29	12.6% 26	12.4% 27	8.1% 18	12.4% 32	7.1% 17	7.2% 22	3.9% 11
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
		Cattle	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10
		Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	22.1% 27	25.4% 32	22.5% 55	21.7% 49	14.7% 28	12.6% 26	12.8% 28	8.1% 18	12.4% 32	7.1% 17	7.2% 22	3.9% 11
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
		Cattle	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10
		Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Humans	23.0% 28	31.7% 40	25.4% 62	24.8% 56	16.8% 32	15.5% 32	15.1% 33	10.4% 23	13.2% 34	8.8% 21	7.5% 23	4.6% 13
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	50.0% 1	0.0% 0	0.0% 0			33.3% 1	33.3% 1	50.0% 1	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	16.7% 1	12.5% 2	0.0% 0	52.6% 10	14.3% 1	80.0% 4	75.0% 3	0.0% 0	37.5% 3	100.0% 3	0.0% 0	25.0% 1
		Cattle	73.4% 80	72.4% 63	74.3% 84	73.3% 55	77.3% 34	85.2% 23	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10
		Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0

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

Table 34c. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

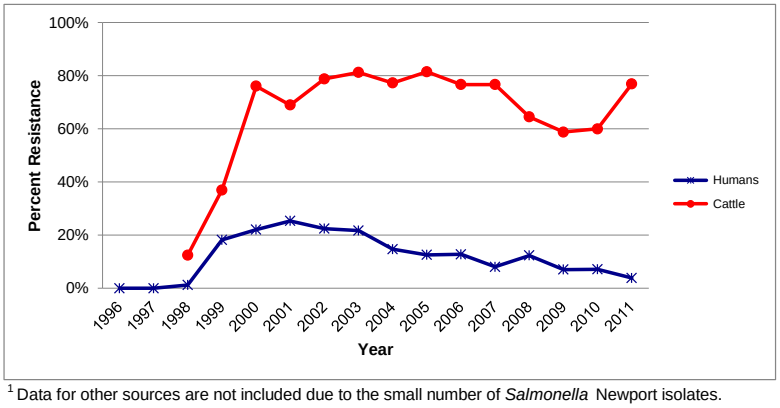
Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	122	126	244	226	191	207	218	222	258	238	305	285
		Retail Chicken			2	0	0	0	0	0	0	1	0	0
		Ground Turkey			1	2	2	3	0	0	3	3	2	0
		Ground Beef			3	1	2	0	0	0	3	2	2	0
		Pork Chops			2	1	0	0	0	0	0	0	0	0
		Chickens	5	8	6	7	0	6	0	3	1	0	1	1
		Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
		Cattle	109	87	113	75	44	27	30	30	31	17	5	13
		Swine	2	7	0	3	0	1	1	1	2	0	0	1
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	4.1% 5	1.6% 2	4.1% 10	1.3% 3	2.1% 4	1.9% 4	3.2% 7	1.8% 4	3.1% 8	1.3% 3	1.3% 4	0.0% 0
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			0.0% 0	0.0% 0	50.0% 1				0.0% 0	0.0% 0	0.0% 0	
		Pork Chops			100.0% 2	0.0% 0								
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		16.7% 1		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	14.7% 16	12.6% 11	7.1% 8	0.0% 0	11.4% 5	25.9% 7	16.7% 5	13.3% 4	12.9% 4	0.0% 0	20.0% 1	7.7% 1
		Swine	0.0% 0	0.0% 0		33.3% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans												0.0% 0
		Retail Chicken												
		Ground Turkey												
		Ground Beef												
		Pork Chops												
		Chickens												0.0% 0
		Turkeys												0.0% 0
		Cattle												0.0% 0
		Swine												0.0% 0
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	23.0% 28	29.4% 37	24.6% 60	23.0% 52	15.7% 30	14.0% 29	15.1% 33	9.9% 22	14.3% 37	8.4% 20	7.5% 23	3.9% 11
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	16.7% 1	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	15.8% 3	28.6% 2	20.0% 1	75.0% 3	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
		Cattle	77.1% 84	70.1% 61	78.8% 89	82.7% 62	81.8% 36	85.2% 23	80.0% 24	76.7% 23	74.2% 23	64.7% 11	60.0% 3	76.9% 10
		Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	23.0% 28	27.8% 35	25.0% 61	22.6% 51	15.2% 29	13.5% 28	12.4% 27	9.5% 21	12.0% 31	7.6% 18	7.2% 22	3.5% 10
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	0.0% 0	21.1% 4	14.3% 1	0.0% 0	0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0
		Cattle	78.9% 86	73.6% 64	77.9% 88	78.7% 59	77.3% 34	81.5% 22	66.7% 20	76.7% 23	64.5% 20	52.9% 9	60.0% 3	76.9% 10
		Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0

Table 34d. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	122	126	244	226	191	207	218	222	258	238	305	285
		Retail Chicken			2	0	0	0	0	0	0	1	0	0
		Ground Turkey			1	2	2	3	0	0	3	3	2	0
		Ground Beef			3	1	2	0	0	0	3	2	2	0
		Pork Chops			2	1	0	0	0	0	0	0	0	0
		Chickens	5	8	6	7	0	6	0	3	1	0	1	1
		Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
		Cattle	109	87	113	75	44	27	30	30	31	17	5	13
		Swine	2	7	0	3	0	1	1	1	2	0	0	1
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0	
		Pork Chops			0.0% 0	0.0% 0								
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0		0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.8% 1	0.0% 0	0.8% 2	0.4% 1	0.5% 1	0.0% 0	0.9% 2	0.0% 0	0.4% 1	0.0% 0	0.3% 1	0.4% 1
		Retail Chicken			0.0% 0							0.0% 0		
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Ground Beef			0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0	
		Pork Chops			0.0% 0	0.0% 0								
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0		0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	23.0% 28	30.2% 38	25.4% 62	24.3% 55	16.8% 32	14.5% 30	14.2% 31	9.9% 22	14.0% 36	8.8% 21	8.2% 25	4.6% 13
		Retail Chicken			100.0% 2							0.0% 0		
		Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			66.7% 2	0.0% 0	0.0% 0	
		Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
		Pork Chops			100.0% 2	100.0% 1								
		Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
		Turkeys	0.0% 0	12.5% 2	40.0% 4	36.8% 7	28.6% 2	60.0% 3	25.0% 1	20.0% 3	62.5% 5	33.3% 1	0.0% 0	50.0% 2
		Cattle	80.7% 88	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	86.7% 26	74.2% 23	70.6% 12	60.0% 3	76.9% 10
		Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			100.0% 1

Ceftriaxone Resistance

Figure 13. Percent of *Salmonella* Newport Isolates from Humans and Cattle Resistant to Ceftriaxone, by Year, 1996-2011[1]



[1] Data for other sources are not included due to the small number of *Salmonella* Newport isolates.
Table 34 contains resistance data for *Salmonella* Newport isolates from each source, by year

Table 35. Number of *Salmonella* Newport Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	51	47	78	99	122	126	244	226	191	207	218	222	258	238	305	285
Retail Chickens							2	0	0	0	0	0	0	1	0	0
Ground Turkey							1	2	2	3	0	0	3	3	2	0
Ground Beef							3	1	2	0	0	0	3	2	2	0
Pork Chops							2	1	0	0	0	0	0	0	0	0
Chickens		0	1	7	5	8	6	7	0	6	0	3	1	0	1	1
Turkeys		0	1	4	6	16	10	19	7	5	4	15	8	3	5	4
Cattle		0	8	54	109	87	113	75	44	27	30	30	31	17	5	13
Swine		0	1	5	2	7	0	3	0	1	1	1	2	0	0	1

Table 36a. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	122	126	244	226	191	207	218	222	258	238	305	285
	Retail Chicken			2	0	0	0	0	0	0	1	0	0
	Ground Turkey			1	2	2	3	0	0	3	3	2	0
	Ground Beef			3	1	2	0	0	0	3	2	2	0
	Pork Chops			2	1	0	0	0	0	0	0	0	0
	Chickens	5	8	6	7	0	6	0	3	1	0	1	1
	Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
	Cattle	109	87	113	75	44	27	30	30	31	17	5	13
	Swine	2	7	0	3	0	1	1	1	2	0	0	1
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	75.4% 92	65.9% 83	72.5% 177	73.5% 166	82.2% 157	84.1% 174	82.6% 180	89.2% 198	85.3% 220	89.1% 212	90.8% 277	94.4% 269
	Retail Chicken			0.0% 0							100.0% 1		
	Ground Turkey			0.0% 0	50.0% 1	100.0% 2	100.0% 3			0.0% 0	66.7% 2	50.0% 1	
	Ground Beef			33.3% 1	0.0% 0	0.0% 0				33.3% 1	100.0% 2	0.0% 0	
	Pork Chops			0.0% 0	0.0% 0								
	Chickens	80.0% 4	62.5% 5	83.3% 5	14.3% 1		50.0% 3		100.0% 3	0.0% 0		100.0% 1	100.0% 1
	Turkeys	83.3% 5	87.5% 14	60.0% 6	21.1% 4	57.1% 4	20.0% 1	25.0% 1	80.0% 12	12.5% 1	0.0% 0	80.0% 4	50.0% 2
	Cattle	19.3% 21	25.3% 22	19.5% 22	14.7% 11	15.9% 7	14.8% 4	16.7% 5	13.3% 4	25.8% 8	29.4% 5	40.0% 2	23.1% 3
	Swine	50.0% 1	14.3% 1		0.0% 0		100.0% 1	100.0% 1	100.0% 1	50.0% 1			0.0% 0
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	23.0% 28	31.0% 39	25.0% 61	23.5% 53	16.2% 31	14.5% 30	15.2% 33	10.8% 24	13.6% 35	8.4% 20	7.5% 23	3.9% 11
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
	Pork Chops			100.0% 2	100.0% 1								
	Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	12.5% 2	0.0% 0	26.3% 5	14.3% 1	80.0% 4	75.0% 3	6.7% 1	37.5% 3	33.3% 1	20.0% 1	25.0% 1
	Cattle	79.8% 87	74.7% 65	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10
	Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	23.0% 28	31.0% 39	25.0% 61	23.0% 52	15.7% 30	14.0% 29	13.3% 29	9.5% 21	13.6% 35	7.6% 18	7.5% 23	3.9% 11
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2	
	Pork Chops			100.0% 2	100.0% 1								
	Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	12.5% 2	0.0% 0	21.1% 4	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1
	Cattle	79.8% 87	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10
	Swine	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	23.0% 28	26.2% 33	23.4% 57	22.6% 51	14.7% 28	12.6% 26	12.8% 28	8.6% 19	12.8% 33	7.1% 17	7.2% 22	3.5% 10
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
	Pork Chops			100.0% 2	100.0% 1								
	Chickens	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	12.5% 1	33.3% 1	0.0% 0	25.0% 1
	Cattle	77.1% 84	69.0% 60	78.8% 89	81.3% 61	79.5% 35	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10
	Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

Table 36b. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	122	126	244	226	191	207	218	222	258	238	305	285
	Retail Chicken			2	0	0	0	0	0	0	1	0	0
	Ground Turkey			1	2	2	3	0	0	3	3	2	0
	Ground Beef			3	1	2	0	0	0	3	2	2	0
	Pork Chops			2	1	0	0	0	0	0	0	0	0
	Chickens	5	8	6	7	0	6	0	3	1	0	1	1
	Turkeys	6	16	10	19	7	5	4	15	8	3	5	4
	Cattle	109	87	113	75	44	27	30	30	31	17	5	13
	Swine	2	7	0	3	0	1	1	1	2	0	0	1
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[1] Resistant	Humans	23.0% 28	25.4% 32	23.4% 57	22.1% 50	14.7% 28	12.6% 26	11.9% 26	8.6% 19	11.6% 30	7.1% 17	7.2% 22	3.5% 10
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
	Pork Chops			100.0% 2	100.0% 1								
	Chickens	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	12.5% 2	0.0% 0	5.3% 1	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	70.6% 77	67.8% 59	70.8% 80	66.7% 50	75.0% 33	81.5% 22	63.3% 19	70.0% 21	64.5% 20	47.1% 8	60.0% 3	76.9% 10
	Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
6. At Least ACT/S[2] Resistant	Humans	4.1% 5	0.8% 1	3.7% 9	1.3% 3	1.0% 2	1.9% 4	2.3% 5	0.5% 1	2.7% 7	1.3% 3	1.3% 4	0.0% 0
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			0.0% 0	0.0% 0	50.0% 1				0.0% 0	0.0% 0	0.0% 0	
	Pork Chops			100.0% 2	0.0% 0								
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		16.7% 1		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	13.8% 15	11.5% 10	7.1% 8	0.0% 0	2.3% 1	25.9% 7	10.0% 3	13.3% 4	12.9% 4	0.0% 0	20.0% 1	7.7% 1
	Swine	0.0% 0	0.0% 0		33.3% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
7. At Least ACSSuTAuCx[3] Resistant	Humans	22.1% 27	24.6% 31	22.5% 55	21.2% 48	14.7% 28	12.6% 26	10.6% 23	8.1% 18	11.6% 30	7.1% 17	7.2% 22	3.5% 10
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1	
	Pork Chops			100.0% 2	100.0% 1								
	Chickens	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0
	Turkeys	0.0% 0	12.5% 2	0.0% 0	5.2% 1	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	69.7% 76	66.7% 58	70.8% 80	66.7% 52	72.7% 32	81.5% 22	63.3% 19	70.0% 21	64.5% 20	47.1% 8	60.0% 3	76.9% 10
	Swine	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.5% 1	0.0% 0	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1
	Retail Chicken			0.0% 0							0.0% 0		
	Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Ground Beef			0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0	
	Pork Chops			0.0% 0	0.0% 0								
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0		0.0% 0	0.0% 0
	Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Swine	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0

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

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

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

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

Table 37a. Antimicrobial Resistance among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	13	14	35	36	36	33	105	73	84	72	78	82
		Retail Chicken			5	2	4	9	9	2	4	8	2	0
		Ground Turkey			2	0	0	0	2	0	0	0	0	0
		Ground Beef			0	0	0	0	0	2	0	0	0	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	N/A[1]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
		Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
		Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
		Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0% 0	7.1% 1	0.0% 0	5.6% 2	5.6% 2	0.0% 0	4.8% 5	1.4% 1	3.6% 3	2.8% 2	1.3% 1	1.2% 1
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2	50.0% 1	0.0% 0	12.5% 1	0.0% 0	
		Ground Turkey			0.0% 0				50.0% 1					
		Ground Beef								50.0% 1				
		Pork Chops												
		Chickens					11.4% 5	9.8% 10	11.4% 9	0.0% 0	6.9% 2	4.8% 1	23.5% 4	16.7% 1
		Turkeys					100.0% 1	0.0% 0	100.0% 1	100.0% 1				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.4% 1	1.2% 1	0.0% 0	1.3% 1	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	0.0% 0	0.0% 0	4.1% 2	0.0% 0	0.0% 0	11.8% 2	0.0% 0
		Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	7.7% 1	14.3% 2	2.9% 1	8.3% 3	5.6% 2	3.0% 1	3.8% 4	8.2% 6	10.7% 9	12.5% 9	19.5% 15	24.4% 20
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2	0.0% 0	0.0% 0	12.5% 1	0.0% 0	
		Ground Turkey			0.0% 0				50.0% 1					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					15.9% 7	9.8% 10	6.3% 5	8.2% 4	10.3% 3	9.5% 2	11.8% 2	16.7% 1
		Turkeys					100.0% 1	50.0% 1	100.0% 1	100.0% 1				0.0% 0
		Cattle					25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						100.0% 1	0.0% 0	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	1.4% 1	4.8% 4	4.2% 3	3.8% 3	4.9% 4
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

Table 37b. Antimicrobial Resistance among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	13	14	35	36	36	33	105	73	84	72	78	82
		Retail Chicken			5	2	4	9	9	2	4	8	2	0
		Ground Turkey			2	0	0	0	2	0	0	0	0	0
		Ground Beef			0	0	0	0	0	2	0	0	0	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	N/A[1]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
		Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
		Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
		Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans		0.0% 0	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	1.4% 1	4.8% 4	2.8% 2	2.6% 2	4.9% 4
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	4.8% 1	0.0% 0	16.7% 1
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	7.1% 1	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	2.7% 2	4.8% 4	2.8% 2	2.6% 2	3.7% 3
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0% 0	0.0% 0	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	2.7% 2	4.8% 4	2.8% 2	2.6% 2	3.7% 3
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Folate Pathway Inhibitors	Sulfisoxazole[2] (MIC ≥ 512 µg/ml)	Humans	0.0% 0	14.3% 2	2.9% 1	5.6% 2	11.1% 4	0.0% 0	8.6% 9	4.1% 3	13.1% 11	13.9% 10	19.5% 15	23.2% 19
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2	50.0% 1	0.0% 0	25.0% 2	0.0% 0	
		Ground Turkey			0.0% 0				50.0% 1					
		Ground Beef								50.0% 1				
		Pork Chops												
		Chickens					13.6% 6	9.8% 10	13.9% 11	6.1% 3	6.9% 2	9.5% 2	29.4% 5	33.3% 2
		Turkeys					100.0% 1	50.0% 1	100.0% 1	100.0% 1				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2

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

[2] Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 37c. Antimicrobial Resistance among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	13	14	35	36	36	33	105	73	84	72	78	82
		Retail Chicken			5	2	4	9	9	2	4	8	2	0
		Ground Turkey			2	0	0	0	2	0	0	0	0	0
		Ground Beef			0	0	0	0	0	2	0	0	0	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	N/A[1]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
		Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
		Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
		Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	0.0% 0	1.4% 1	4.8% 4	1.4% 1	1.3% 1	1.2% 1
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					4.5% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans												0.0% 0
		Retail Chicken												
		Ground Turkey												
		Ground Beef												
		Pork Chops												
		Chickens												0.0% 0
		Turkeys												0.0% 0
		Cattle												0.0% 0
		Swine												0.0% 0
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	7.7% 1	7.1% 1	8.6% 3	8.3% 3	5.6% 2	6.1% 2	6.7% 7	5.5% 4	9.5% 8	11.1% 8	21.8% 17	26.8% 22
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					6.8% 3	8.8% 9	17.7% 14	20.4% 10	6.9% 2	9.5% 2	5.9% 1	16.7% 1
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
		Swine						100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0	100.0% 2
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2	1.4% 1	6.0% 5	8.3% 6	1.3% 1	2.4% 2
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	50.0% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0

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

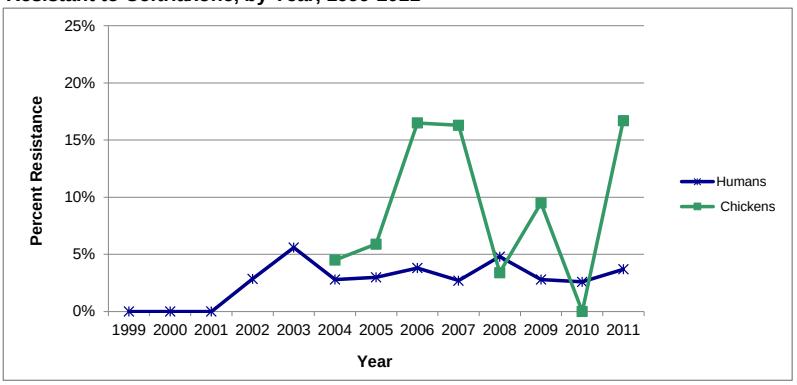
Table 37d. Antimicrobial Resistance among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	13	14	35	36	36	33	105	73	84	72	78	82
		Retail Chicken			5	2	4	9	9	2	4	8	2	0
		Ground Turkey			2	0	0	0	2	0	0	0	0	0
		Ground Beef			0	0	0	0	0	2	0	0	0	0
		Pork Chops			0	0	0	0	0	0	0	0	0	0
		Chickens	N/A[1]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
		Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
		Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
		Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	2.8% 1	2.8% 1	0.0% 0	1.0% 1	1.4% 1	1.2% 1	0.0% 0	2.6% 2	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	7.7% 1	7.1% 1	5.7% 2	0.0% 0	11.1% 4	3.0% 1	8.6% 9	9.6% 7	16.7% 14	16.7% 12	28.6% 22	25.6% 21
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	11.1% 1	11.1% 1	0.0% 0	0.0% 0	25.0% 2	0.0% 0	
		Ground Turkey			0.0% 0				0.0% 0					
		Ground Beef								0.0% 0				
		Pork Chops												
		Chickens					11.4% 5	4.9% 5	3.8% 3	14.3% 7	3.4% 1	9.5% 2	11.8% 2	33.3% 2
		Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				100.0% 1
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Swine						100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2

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

Ceftriaxone Resistance

Figure 14. Percent of *Salmonella* I 4,[5],12:i:- Isolates from Humans and Chickens Resistant to Ceftriaxone, by Year, 1999-2011[1]



[1] Data for other sources and data for humans for 1996-1998 are not included due to the small number of *Salmonella* I 4,[5],12:i:- isolates. Data for food animals are not available for this serotype prior to 2004. Table 37 contains all resistance data available for *Salmonella* I 4,[5],12:i:- isolates

Table 38. Number of *Salmonella* I 4,[5],12:i:- Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	3	3	0	8	13	14	35	36	36	33	105	73	84	72	78	82
Retail Chickens							5	2	4	9	9	2	4	8	2	0
Ground Turkey							2	0	0	0	2	0	0	0	0	0
Ground Beef							0	0	0	0	0	2	0	0	0	0
Pork Chops							0	0	0	0	0	0	0	0	0	0
Chickens		N/A[1]	N/A	N/A	N/A	N/A	N/A	N/A	44	102	79	49	29	21	17	6
Turkeys		N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
Cattle		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
Swine		N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2

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

Table 39a. Resistance Patterns among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	13	14	35	36	36	33	105	73	84	72	78	82
	Retail Chicken			5	2	4	9	9	2	4	8	2	0
	Ground Turkey			2	0	0	0	2	0	0	0	0	0
	Ground Beef			0	0	0	0	0	2	0	0	0	0
	Pork Chops			0	0	0	0	0	0	0	0	0	0
	Chickens	N/A[2]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
	Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
	Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
	Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	92.3% 12	78.6% 11	91.4% 32	77.8% 28	80.6% 29	87.9% 29	85.7% 90	82.2% 60	76.2% 64	76.4% 55	66.7% 52	65.9% 54
	Retail Chicken			100.0% 5	100.0% 2	100.0% 4	88.9% 8	55.6% 5	50.0% 1	100.0% 4	75.0% 6	100.0% 2	
	Ground Turkey			100.0% 2				50.0% 1					
	Ground Beef								50.0% 1				
	Pork Chops												
	Chickens					77.3% 34	76.5% 78	68.4% 54	65.3% 32	82.8% 24	76.2% 16	70.6% 12	50.0% 3
	Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
	Cattle					75.0% 3	100.0% 2	100.0% 3	100.0% 6	100.0% 1	100.0% 1		50.0% 1
	Swine						0.0% 0	50.0% 1	100.0% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	7.7% 1	7.1% 1	5.7% 2	5.6% 2	8.3% 3	3.0% 1	9.5% 10	5.5% 4	10.7% 9	12.5% 9	21.8% 17	26.8% 22
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2	0.0% 0	0.0% 0	12.5% 1	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					13.6% 6	9.8% 10	19.0% 15	20.4% 10	6.9% 2	9.5% 2	11.8% 2	33.3% 2
	Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1
	Swine						100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	3.8% 4	2.7% 2	7.1% 6	9.7% 7	19.2% 15	20.7% 17
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					2.3% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	4.8% 1	5.9% 1	0.0% 0
	Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	2.9% 3	1.4% 1	4.8% 4	6.9% 5	3.8% 3	1.2% 1
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					2.3% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	4.8% 1	0.0% 0	0.0% 0
	Turkeys					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

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

Table 39b. Resistance Patterns among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	13	14	35	36	36	33	105	73	84	72	78	82
	Retail Chicken			5	2	4	9	9	2	4	8	2	0
	Ground Turkey			2	0	0	0	2	0	0	0	0	0
	Ground Beef			0	0	0	0	0	2	0	0	0	0
	Pork Chops			0	0	0	0	0	0	0	0	0	0
	Chickens	N/A[1]	N/A	N/A	N/A	44	102	79	49	29	21	17	6
	Turkeys	N/A	N/A	N/A	N/A	1	2	1	1	0	0	0	1
	Cattle	N/A	N/A	N/A	N/A	4	2	3	6	1	1	0	2
	Swine	N/A	N/A	N/A	N/A	0	1	2	1	1	1	1	2
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[2] Resistant	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2	1.4% 1	3.6% 3	6.9% 5	1.3% 1	1.2% 1
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0
6. At Least ACT/S[3] Resistant	Humans	0.0% 0	7.1% 1	2.9% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
7. At Least ACSSuTAuCx[4] Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.4% 2	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ground Turkey			0.0% 0				0.0% 0					
	Ground Beef								0.0% 0				
	Pork Chops												
	Chickens					2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys					0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0
	Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Swine						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

[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

I. Antimicrobial Susceptibility among *Salmonella* serotype Heidelberg

Table 40a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	79	102	105	96	92	125	102	98	75	86	62	70
		Retail Chicken			11	16	31	22	30	14	30	44	21	11
		Ground Turkey			21	32	37	53	35	41	57	10	17	28
		Ground Beef			0	0	0	0	0	0	1	0	0	0
		Pork Chops			3	0	3	0	4	0	0	1	0	1
		Chickens	259	329	403	226	167	283	164	142	94	74	25	28
		Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
		Cattle	6	10	8	9	1	6	4	0	3	0	2	0
		Swine	22	16	11	11	4	8	13	2	1	4	5	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16)	Humans	8.9% 7	7.8% 8	3.8% 4	5.2% 5	4.3% 4	6.4% 8	4.9% 5	16.3% 16	14.7% 11	2.3% 2	8.1% 5	20.0% 14
		Retail Chicken			45.5% 5	18.8% 3	9.7% 3	13.6% 3	20.0% 6	7.1% 1	26.7% 8	2.3% 1	4.8% 1	0.0% 0
		Ground Turkey			23.8% 5	12.5% 4	35.1% 13	37.7% 20	31.4% 11	24.4% 10	57.9% 33	70.0% 7	29.4% 5	78.6% 22
		Ground Beef									100.0% 1			
		Pork Chops			100.0% 3		0.0% 0		75.0% 3			0.0% 0		0.0% 0
		Chickens	32.0% 83	12.5% 41	8.9% 36	7.5% 17	10.2% 17	9.2% 26	9.8% 16	11.3% 16	10.6% 10	23.0% 17	28.0% 7	14.3% 4
		Turkeys	12.0% 15	13.4% 19	18.3% 11	12.3% 7	17.4% 8	36.0% 9	32.6% 14	13.0% 3	50.0% 4	33.3% 1	21.4% 3	60.0% 3
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		50.0% 1	
		Swine	9.1% 2	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	
	Kanamycin (MIC ≥ 64)	Humans	15.2% 12	19.6% 20	10.5% 11	8.3% 8	8.7% 8	12.8% 16	8.8% 9	11.2% 11	26.7% 20	20.9% 18	21.0% 13	21.4% 15
		Retail Chicken			36.4% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.1% 1	10.0% 3	15.9% 7	19.0% 4	0.0% 0
		Ground Turkey			38.1% 8	34.4% 11	27.0% 10	30.2% 16	34.3% 12	56.1% 23	52.6% 30	20.0% 2	76.5% 13	32.1% 9
		Ground Beef									100.0% 1			
		Pork Chops			0.0% 0		33.3% 1		0.0% 0			100.0% 1		100.0% 1
		Chickens	12.0% 31	4.3% 14	3.7% 15	5.3% 12	6.0% 10	6.7% 19	7.3% 12	6.3% 9	8.5% 8	12.2% 9	32.0% 8	7.1% 2
		Turkeys	43.2% 54	31.0% 44	30.0% 18	21.1% 12	19.6% 9	44.0% 11	27.9% 12	34.8% 8	50.0% 4	66.7% 2	64.3% 9	20.0% 1
		Cattle	16.7% 1	10.0% 1	37.5% 3	55.6% 5	100.0% 1	50.0% 3	0.0% 0		33.3% 1		50.0% 1	
		Swine	77.3% 17	75.0% 12	54.5% 6	100.0% 11	75.0% 3	75.0% 6	84.6% 11	100.0% 2	100.0% 1	50.0% 2	60.0% 3	
	Streptomycin (MIC ≥ 64)	Humans	22.8% 18	25.5% 26	17.1% 18	12.5% 12	15.2% 14	13.6% 17	11.8% 12	12.2% 12	30.7% 23	23.3% 20	25.8% 16	37.1% 26
		Retail Chicken			63.6% 7	12.5% 2	22.6% 7	18.2% 4	23.3% 7	21.4% 3	40.0% 12	13.6% 6	14.3% 3	9.1% 1
		Ground Turkey			57.1% 12	37.5% 12	43.2% 16	47.2% 25	45.7% 16	39.0% 16	71.9% 41	60.0% 6	94.1% 16	92.9% 26
		Ground Beef									100.0% 1			
		Pork Chops			100.0% 3		33.3% 1		0.0% 0			100.0% 1		100.0% 1
		Chickens	36.7% 95	20.4% 67	18.6% 75	17.7% 40	18.0% 30	15.5% 44	10.4% 17	13.4% 19	16.0% 15	27.0% 20	44.0% 11	14.3% 4
		Turkeys	52.8% 66	40.1% 57	35.0% 21	28.1% 16	21.7% 10	44.0% 11	34.9% 15	26.1% 6	37.5% 3	66.7% 2	57.1% 8	60.0% 3
		Cattle	16.7% 1	20.0% 2	37.5% 3	55.6% 5	100.0% 1	50.0% 3	0.0% 0		33.3% 1		50.0% 1	
		Swine	86.4% 19	75.0% 12	45.5% 5	100.0% 11	75.0% 3	87.5% 7	69.2% 9	100.0% 2	100.0% 1	50.0% 2	80.0% 4	
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	3.8% 3	2.9% 3	9.5% 10	5.2% 5	9.8% 9	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18	24.2% 15	10.0% 7
		Retail Chicken			0.0% 0	6.3% 1	9.7% 3	13.6% 3	10.0% 3	21.4% 3	16.7% 5	31.8% 14	23.8% 5	0.0% 0
		Ground Turkey			19.0% 4	9.4% 3	5.4% 2	9.4% 5	17.1% 6	9.8% 4	7.0% 4	10.0% 1	23.5% 4	39.6% 11
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
		Chickens	13.5% 35	7.0% 23	8.7% 35	9.3% 21	10.2% 17	21.9% 62	15.9% 26	17.6% 25	8.5% 8	17.6% 13	32.0% 8	17.9% 5
		Turkeys	2.4% 3	5.6% 8	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4	26.1% 6	12.5% 1	33.3% 1	35.7% 5	20.0% 1
		Cattle	0.0% 0	0.0% 0	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1		50.0% 1	
		Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	20.0% 1	

Table 40b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	79	102	105	96	92	125	102	98	75	86	62	70
		Retail Chicken			11	16	31	22	30	14	30	44	21	11
		Ground Turkey			21	32	37	53	35	41	57	10	17	28
		Ground Beef			0	0	0	0	0	0	1	0	0	0
		Pork Chops			3	0	3	0	4	0	0	1	0	1
		Chickens	259	329	403	226	167	283	164	142	94	74	25	28
		Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
		Cattle	6	10	8	9	1	6	4	0	3	0	2	0
		Swine	22	16	11	11	4	8	13	2	1	4	5	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	2.5% 2	2.9% 3	8.6% 9	5.2% 5	7.6% 7	8.8% 11	8.8% 9	7.1% 7	8.0% 6	19.8% 17	24.2% 15	8.6% 6
		Retail Chicken			0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.8% 14	19.0% 4	0.0% 0
		Ground Turkey			19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.5% 2	10.0% 1	23.5% 4	35.7% 10
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
		Chickens	13.5% 35	5.2% 17	7.4% 30	7.1% 16	10.2% 17	21.6% 61	15.2% 25	16.9% 24	8.5% 8	17.6% 13	32.0% 8	17.9% 5
		Turkeys	2.4% 3	4.9% 7	1.7% 1	0.0% 0	6.5% 3	0.0% 0	9.3% 4	17.4% 4	12.5% 1	33.3% 1	35.7% 5	20.0% 1
		Cattle	0.0% 0	0.0% 0	37.5% 3	44.4% 4	100.0% 1	66.7% 4	0.0% 0		33.3% 1		50.0% 1	
		Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	3.8% 3	2.9% 3	7.6% 8	5.2% 5	8.7% 8	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18	24.2% 15	8.6% 6
		Retail Chicken			0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.8% 14	23.8% 5	0.0% 0
		Ground Turkey			19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.5% 2	10.0% 1	23.5% 4	39.3% 11
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
		Chickens	13.9% 36	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26	16.9% 24	8.5% 8	17.6% 13	32.8% 8	17.9% 5
		Turkeys	3.2% 4	5.6% 8	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4	26.1% 6	12.5% 1	33.3% 1	35.7% 5	20.0% 1
		Cattle	0.0% 0	0.0% 0	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1		50.0% 1	
		Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	3.8% 3	2.9% 3	7.6% 8	5.2% 5	8.7% 8	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18	24.2% 15	8.6% 6
		Retail Chicken			0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.8% 14	23.8% 5	0.0% 0
		Ground Turkey			19.1% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.5% 2	10.0% 1	23.5% 4	39.3% 11
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
		Chickens	13.5% 35	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26	17.6% 25	8.5% 8	17.6% 13	32.0% 8	17.9% 5
		Turkeys	2.4% 3	5.6% 8	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4	26.1% 6	12.5% 1	33.3% 1	35.7% 5	20.0% 1
		Cattle	0.0% 0	0.0% 0	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1		50.0% 1	
		Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Humans	11.4% 9	8.8% 9	6.7% 7	7.3% 7	7.6% 7	8.0% 10	4.9% 5	18.4% 18	12.0% 9	7.0% 6	11.3% 7	7.1% 5
		Retail Chicken			45.5% 5	12.5% 2	12.9% 4	13.6% 3	26.7% 8	7.1% 1	26.7% 8	2.3% 1	14.3% 3	0.0% 0
		Ground Turkey			28.6% 6	15.6% 5	37.8% 14	35.8% 19	37.1% 13	26.8% 11	29.8% 17	50.0% 5	35.3% 6	32.1% 9
		Ground Beef									100.0% 1			
		Pork Chops			100.0% 3		0.0% 0		100.0% 4			100.0% 1		0.0% 0
		Chickens	33.2% 86	16.4% 54	9.7% 39	11.1% 25	12.6% 21	10.6% 30	7.9% 13	13.4% 19	12.8% 12	21.6% 16	36.0% 9	17.9% 5
		Turkeys	15.2% 19	27.5% 39	30.0% 18	19.3% 11	26.1% 12	52.0% 13	30.2% 13	34.8% 8	37.5% 3	0.0% 0	28.6% 4	40.0% 2
		Cattle	0.0% 0	10.0% 1	12.5% 1	44.4% 4	100.0% 1	50.0% 3	0.0% 0		33.3% 1		50.0% 1	
		Swine	13.6% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	

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

Table 40c. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

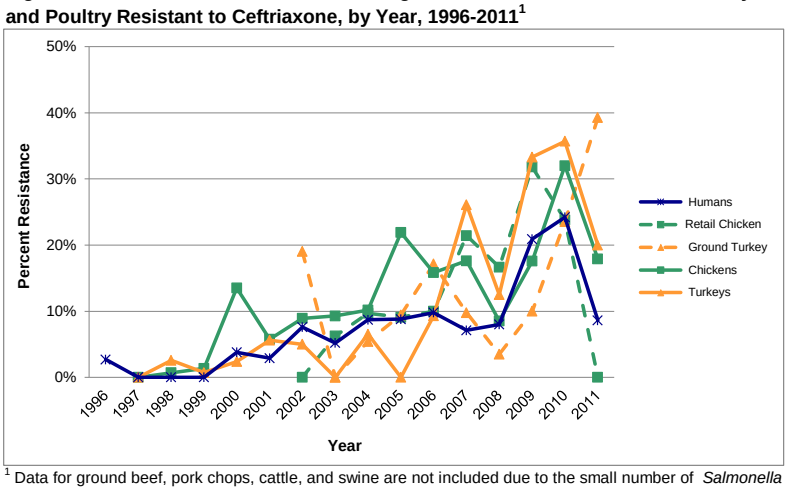
Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	79	102	105	96	92	125	102	98	75	86	62	70
		Retail Chicken			11	16	31	22	30	14	30	44	21	11
		Ground Turkey			21	32	37	53	35	41	57	10	17	28
		Ground Beef			0	0	0	0	0	0	1	0	0	0
		Pork Chops			3	0	3	0	4	0	0	1	0	1
		Chickens	259	329	403	226	167	283	164	142	94	74	25	28
		Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
		Cattle	6	10	8	9	1	6	4	0	3	0	2	0
		Swine	22	16	11	11	4	8	13	2	1	4	5	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	1.3% 1	2.0% 2	1.0% 1	2.1% 2	0.0% 0	0.8% 1	0.0% 0	0.0% 0	2.7% 2	3.5% 3	0.0% 0	1.4% 1
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.7% 3
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		100.0% 4			100.0% 1		0.0% 0
		Chickens	0.4% 1	0.3% 1	0.7% 3	0.9% 2	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.8% 1	3.5% 5	3.3% 2	3.5% 2	0.0% 0	0.0% 0	0.0% 0	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	10.0% 1	0.0% 0	55.6% 5	100.0% 1	50.0% 3	0.0% 0		0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans												0.0% 0
		Retail Chicken												0.0% 0
		Ground Turkey												0.0% 0
		Ground Beef												
		Pork Chops												0.0% 0
		Chickens												0.0% 0
		Turkeys												0.0% 0
		Cattle												
		Swine												
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	10.1% 8	9.8% 10	12.4% 13	10.4% 10	25.0% 23	20.0% 25	18.6% 19	18.4% 18	28.0% 21	27.9% 24	38.7% 24	30.0% 21
		Retail Chicken			18.2% 2	18.8% 3	25.8% 8	27.3% 6	16.7% 5	21.4% 3	23.3% 7	31.8% 14	23.8% 5	0.0% 0
		Ground Turkey			19.0% 4	9.4% 3	13.5% 5	18.9% 10	31.4% 11	53.7% 22	82.5% 47	80.0% 8	70.6% 12	96.4% 27
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
		Chickens	24.7% 64	16.7% 55	14.9% 60	19.0% 43	16.2% 27	25.1% 71	16.5% 27	20.4% 29	13.8% 13	20.3% 15	40.0% 10	21.4% 6
		Turkeys	4.0% 5	9.2% 13	13.3% 8	3.5% 2	17.4% 8	24.0% 6	37.2% 16	65.2% 15	50.0% 4	66.7% 2	57.1% 8	60.0% 3
		Cattle	0.0% 0	0.0% 0	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0		66.7% 2		50.0% 1	
		Swine	9.1% 2	0.0% 0	18.2% 2	9.1% 1	0.0% 0	12.5% 1	7.7% 1	0.0% 0	100.0% 1	0.0% 0	20.0% 1	
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	1.3% 1	1.0% 1	1.0% 1	0.0% 0	1.1% 1	0.8% 1	0.0% 0	3.1% 3	1.3% 1	4.7% 4	1.6% 1	4.3% 3
		Retail Chicken			0.0% 0	0.0% 0	3.2% 1	0.0% 0	0.0% 0	7.1% 1	3.3% 1	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0	5.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.7% 3
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
		Chickens	11.6% 30	3.3% 11	1.7% 7	3.1% 7	4.2% 7	3.2% 9	2.4% 4	4.2% 6	4.3% 4	5.4% 4	20.0% 5	3.6% 1
		Turkeys	1.6% 2	2.8% 4	1.7% 1	0.0% 0	0.0% 0	0.0% 0	4.7% 2	4.3% 1	12.5% 1	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	10.0% 1	25.0% 2	44.4% 4	100.0% 1	50.0% 3	0.0% 0		0.0% 0		0.0% 0	
		Swine	4.5% 1	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	

Table 40d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	79	102	105	96	92	125	102	98	75	86	62	70
		Retail Chicken			11	16	31	22	30	14	30	44	21	11
		Ground Turkey			21	32	37	53	35	41	57	10	17	28
		Ground Beef			0	0	0	0	0	0	1	0	0	0
		Pork Chops			3	0	3	0	4	0	0	1	0	1
		Chickens	259	329	403	226	167	283	164	142	94	74	25	28
		Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
		Cattle	6	10	8	9	1	6	4	0	3	0	2	0
		Swine	22	16	11	11	4	8	13	2	1	4	5	0
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.0% 0	0.0% 0	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	1.3% 1	0.0% 0	0.0% 0	1.0% 1	0.0% 0	0.8% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			4.8% 1	0.0% 0	0.0% 0	1.9% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef									0.0% 0			
		Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
		Chickens	0.0% 0	0.0% 0	0.7% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys	0.8% 1	0.0% 0	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	21.5% 17	24.5% 25	19.0% 20	16.7% 16	19.6% 18	18.4% 23	13.7% 14	22.4% 22	36.0% 27	27.9% 24	22.6% 14	34.3% 24
		Retail Chicken			45.5% 5	0.0% 0	6.5% 2	4.5% 1	3.3% 1	7.1% 1	26.7% 8	15.9% 7	14.3% 3	9.1% 1
		Ground Turkey			57.1% 12	43.8% 14	70.3% 26	56.6% 30	68.6% 24	70.7% 29	79.0% 45	60.0% 6	82.4% 14	92.9% 26
		Ground Beef									100.0% 1			
		Pork Chops			66.7% 2		100.0% 3		0.0% 0			100.0% 1		100.0% 1
		Chickens	20.1% 52	14.9% 49	11.7% 47	16.4% 37	15.0% 25	14.5% 41	12.2% 20	12.7% 18	13.8% 13	14.9% 11	32.0% 8	10.7% 3
		Turkeys	64.0% 80	54.2% 77	70.0% 42	84.2% 48	73.9% 34	64.0% 16	62.8% 27	65.2% 15	87.5% 7	66.7% 2	100.0% 14	80.0% 4
		Cattle	33.3% 2	40.0% 4	62.5% 5	55.6% 5	100.0% 1	66.7% 4	0.0% 0		33.3% 1		50.0% 1	
		Swine	81.8% 18	93.8% 15	72.7% 8	100.0% 11	75.0% 3	87.5% 7	92.3% 12	100.0% 2	100.0% 1	100.0% 4	80.0% 4	

Ceftriaxone Resistance

Figure 15. Percent of *Salmonella* Heidelberg Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftriaxone, by Year, 1996-2011[1]



[1] Data for ground beef, pork chops, cattle, and swine are not included due to the small number of *Salmonella* Heidelberg isolates from these sources. Table 40 contains resistance data for *Salmonella* Heidelberg isolates from each source, by year

Table 41. Number of *Salmonella* Heidelberg Isolates Tested from Humans, Food Animals, and Retail Meats, by Year, 1996-2011

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	74	75	101	88	79	102	105	96	92	125	102	98	75	86	62	70
Retail Chickens							11	16	31	22	30	14	30	44	21	11
Ground Turkey							21	32	37	53	35	41	57	10	17	28
Ground Beef							0	0	0	0	0	0	1	0	0	0
Pork Chops							3	0	3	0	4	0	0	1	0	1
Chickens		51	143	297	259	329	403	226	167	283	164	142	94	74	25	28
Turkeys		14	39	139	125	142	60	57	46	25	43	23	8	3	14	5
Cattle		1	11	28	6	10	8	9	1	6	4	0	3	0	2	0
Swine		7	37	33	22	16	11	11	4	8	13	2	1	4	5	0

Table 42a. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	79	102	105	96	92	125	102	98	75	86	62	70
	Retail Chicken			11	16	31	22	30	14	30	44	21	11
	Ground Turkey			21	32	37	53	35	41	57	10	17	28
	Ground Beef			0	0	0	0	0	0	1	0	0	0
	Pork Chops			3	0	3	0	4	0	0	1	0	1
	Chickens	259	329	403	226	167	283	164	142	94	74	25	28
	Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
	Cattle	6	10	8	9	1	6	4	0	3	0	2	0
	Swine	22	16	11	11	4	8	13	2	1	4	5	0
Resistance Pattern	**Isolate Source**												
1. No Resistance Detected	Humans	63.3% 50	64.7% 66	67.6% 71	68.8% 66	56.5% 52	62.4% 78	67.6% 69	58.2% 57	57.3% 43	60.5% 52	53.2% 33	55.7% 39
	Retail Chicken			27.3% 3	62.5% 10	58.1% 18	54.5% 12	50.0% 15	50.0% 7	50.0% 15	61.4% 27	61.9% 13	90.9% 10
	Ground Turkey			33.3% 7	50.0% 16	16.2% 6	20.8% 11	8.6% 3	9.8% 4	1.8% 1	10.0% 1	0.0% 0	0.0% 0
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
	Chickens	48.6% 126	63.5% 209	66.5% 268	62.8% 142	68.3% 114	59.4% 168	67.1% 110	65.5% 93	70.2% 66	55.4% 41	36.0% 9	71.4% 20
	Turkeys	28.8% 36	31.0% 44	15.0% 9	8.8% 5	15.2% 7	16.0% 4	23.3% 10	17.4% 4	0.0% 0	33.3% 1	0.0% 0	0.0% 0
	Cattle	66.7% 4	60.0% 6	12.5% 1	44.4% 4	0.0% 0	0.0% 0	100.0% 4		33.3% 1		50.0% 1	
	Swine	13.6% 3	6.3% 1	27.3% 3	0.0% 0	0.0% 0	12.5% 1	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	7.6% 6	7.8% 8	12.4% 13	10.4% 10	13.0% 12	15.2% 19	12.7% 13	17.3% 17	28.0% 21	25.6% 22	33.9% 21	30.0% 21
	Retail Chicken			45.5% 5	6.3% 1	12.9% 4	13.6% 3	13.3% 4	28.6% 4	33.3% 10	34.1% 15	28.6% 6	0.0% 0
	Ground Turkey			23.8% 5	12.5% 4	27.0% 10	34.0% 18	40.0% 14	53.7% 22	82.5% 47	70.0% 7	64.7% 11	92.9% 26
	Ground Beef									100.0% 1			
	Pork Chops			66.7% 2		0.0% 0		0.0% 0			100.0% 1		0.0% 0
	Chickens	19.3% 50	12.8% 42	10.9% 44	13.3% 30	15.6% 26	24.4% 69	17.1% 28	20.4% 29	12.8% 12	24.3% 18	36.0% 9	17.9% 5
	Turkeys	10.4% 13	16.9% 24	21.7% 13	14.0% 8	23.9% 11	36.0% 9	44.2% 19	69.6% 16	50.0% 4	66.7% 2	57.1% 8	60.0% 3
	Cattle	0.0% 0	10.0% 1	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0% 0		66.7% 2		50.0% 1	
	Swine	13.6% 3	0.0% 0	18.2% 2	9.1% 1	0.0% 0	25.0% 2	7.7% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0	
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	3.8% 3	2.0% 2	1.9% 2	0.0% 0	4.3% 4	4.8% 6	2.0% 2	5.1% 5	13.3% 10	17.4% 15	11.3% 7	4.3% 3
	Retail Chicken			0.0% 0	0.0% 0	6.5% 2	0.0% 0	0.0% 0	0.0% 0	13.3% 4	9.1% 4	9.5% 2	0.0% 0
	Ground Turkey			19.1% 4	9.4% 3	10.8% 4	7.6% 4	17.1% 6	14.6% 6	19.3% 11	30.0% 3	29.4% 5	46.4% 13
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
	Chickens	13.5% 35	4.0% 13	3.7% 15	5.3% 12	7.8% 13	6.7% 19	4.3% 7	6.3% 9	4.2% 4	9.5% 7	20.0% 5	14.3% 4
	Turkeys	4.0% 5	5.6% 8	6.7% 4	1.8% 1	6.5% 3	12.0% 3	14.0% 6	21.7% 5	25.0% 2	33.3% 1	35.7% 5	20.0% 1
	Cattle	0.0% 0	10.0% 1	25.0% 2	55.6% 5	100.0% 1	50.0% 3	0.0% 0		33.0% 1		50.0% 1	
	Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0	
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	2.5% 2	1.0% 1	1.9% 2	0.0% 0	3.3% 3	1.6% 2	2.0% 2	4.1% 4	6.7% 5	15.1% 13	9.7% 6	4.3% 3
	Retail Chicken			0.0% 0	0.0% 0	3.2% 1	0.0% 0	0.0% 0	0.0% 0	6.7% 2	9.1% 4	4.8% 1	0.0% 0
	Ground Turkey			19.1% 4	6.3% 2	5.4% 2	0.0% 0	8.6% 3	2.4% 1	1.8% 1	10.0% 1	23.5% 4	39.3% 11
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0
	Chickens	12.4% 32	3.6% 12	2.7% 11	4.4% 10	3.6% 6	4.9% 14	4.3% 7	5.6% 8	4.2% 4	8.1% 6	20.0% 5	10.7% 3
	Turkeys	3.2% 4	4.2% 6	3.3% 2	0.0% 0	2.2% 1	0.0% 0	9.3% 4	8.7% 2	25.0% 2	33.3% 1	35.7% 5	20.0% 1
	Cattle	0.0% 0	0.0% 0	25.0% 2	55.6% 5	100.0% 1	50.0% 3	0.0% 0		0.0% 0		50.0% 1	
	Swine	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0	

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

Table 42b. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	Humans	79	102	105	96	92	125	102	98	75	86	62	70
	Retail Chicken			11	16	31	22	30	14	30	44	21	11
	Ground Turkey			21	32	37	53	35	41	57	10	17	28
	Ground Beef			0	0	0	0	0	0	1	0	0	0
	Pork Chops			3	0	3	0	4	0	0	1	0	1
	Chickens	259	329	403	226	167	283	164	142	94	74	25	28
	Turkeys	125	142	60	57	46	25	43	23	8	3	14	5
	Cattle	6	10	8	9	1	6	4	0	3	0	2	0
	Swine	22	16	11	11	4	8	13	2	1	4	5	0
Resistance Pattern	**Isolate Source**												
5. At Least ACSSuT[1] Resistant	Humans	1.3% 1	1.0% 1	1.0% 1	0.0% 0	1.1% 1	0.0% 0	0.0% 0	3.1% 3	1.3% 1	3.5% 3	1.6% 1	1.4% 1
	Retail Chicken			0.0% 0	0.0% 0	3.2% 1	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0	5.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.7% 3
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
	Chickens	11.2% 29	3.0% 10	1.5% 6	2.2% 5	2.4% 4	2.8% 8	1.8% 3	4.2% 6	4.2% 4	4.1% 3	16.0% 4	3.6% 1
	Turkeys	1.6% 2	2.8% 4	1.7% 1	0.0% 0	0.0% 0	0.0% 0	4.7% 2	4.3% 1	12.5% 1	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0% 0		0.0% 0		0.0% 0	
	Swine	4.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	
6. At Least ACT/S[2] Resistant	Humans	0.0% 0	0.0% 0	1.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.5% 3	0.0% 0	1.4% 1
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.7% 3
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0	1.4% 2	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	0.0% 0	44.4% 4	100.0% 1	50.0% 3	0.0% 0		0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
7. At Least ACSSuTAuCx[3] Resistant	Humans	1.3% 1	1.0% 1	1.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.2% 1	0.0% 0	1.4% 1
	Retail Chicken			0.0% 0	0.0% 0	3.2% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0	5.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.7% 3
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
	Chickens	11.2% 29	2.7% 9	1.5% 6	2.2% 5	2.4% 4	2.8% 8	1.8% 3	4.2% 6	2.1% 2	4.1% 3	16.0% 4	3.6% 1
	Turkeys	0.8% 1	2.8% 4	1.7% 1	0.0% 0	0.0% 0	0.0% 0	4.7% 2	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0% 0		0.0% 0		0.0% 0	
	Swine	4.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef									0.0% 0			
	Pork Chops			0.0% 0		0.0% 0		0.0% 0			0.0% 0		0.0% 0
	Chickens	0.0% 0	0.0% 0	1.0% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	
	Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	

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

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

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

V. *Campylobacter* Data

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

Table 43. Number of *Campylobacter jejuni* Isolates Tested, by Source and Year, 1997-2011[1]

	Year														
Source	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Humans	209	297	293	306	365	329	303	320	788	709	992	1042	1350	1158	1275
Retail Chicken						198	325	510	403	426	332	329	404	355	393
Ground Turkey						2	4	7	10	12	20	10	9	5	13
Chickens					64 [2]	526	374	508	567	228	166	78	117	208	344

[1] Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports
[2] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

Table 44. Number of *Campylobacter coli* Isolates Tested, by Source and Year, 1997-2011[1]

	Year														
Source	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Humans	6	8	20	12	17	25	22	26	99	97	105	110	142	116	148
Retail Chicken						90	142	196	151	145	143	181	176	148	210
Ground Turkey						2	1	5	9	10	14	19	16	7	18
Chickens					52 [2]	288	247	186	380	123	76	28	81	100	233

[1] Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports
[2] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

B. Isolation of *Campylobacter* from Retail Poultry

Table 45. Number and Percent of Retail Poultry Samples Culture Positive for *Campylobacter*, 2011[1]

	Retail Chicken	Ground Turkey
Number of Meat Samples Tested	1320	1320
Number Positive for *Campylobacter*	603	31
Percent Positive for *Campylobacter*	45.7%	2.3%

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

Figure 16. Percent of Retail Poultry Samples Culture Positive for *Campylobacter*, 2011

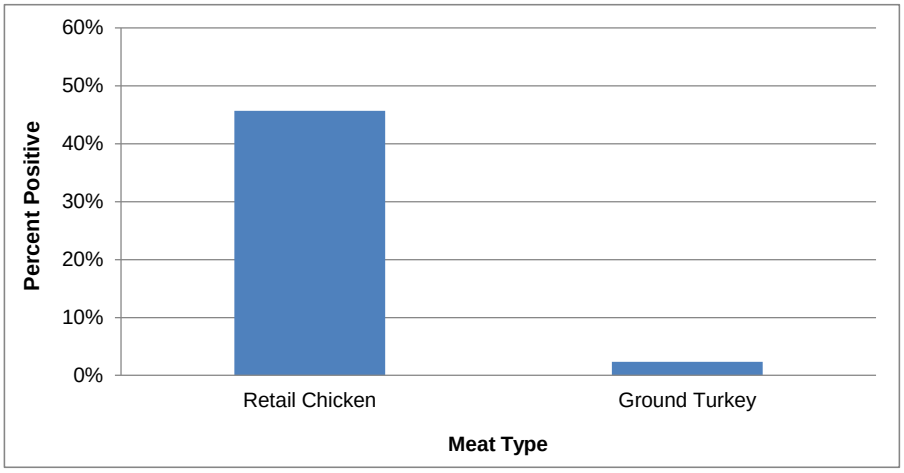
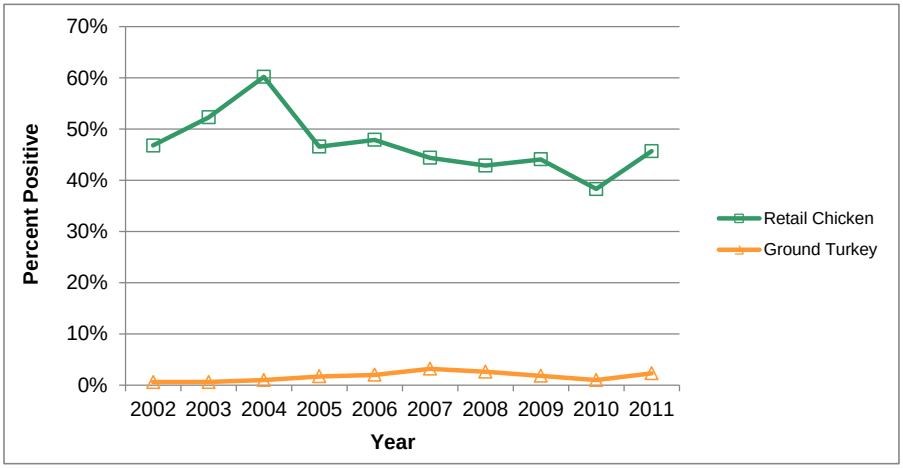


Figure 17. Percent of Retail Poultry Samples Culture Positive for *Campylobacter*, 2002-2011



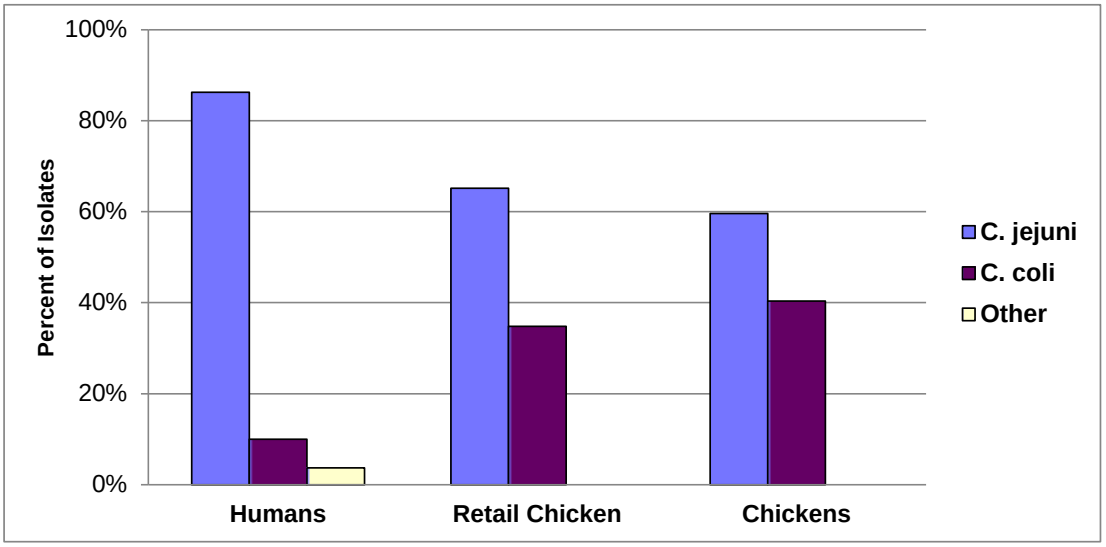
C. *Campylobacter* Species

Table 46. *Campylobacter* Species Isolated from Humans, Retail Meats, and Chickens, 2011

	Humans	Retail Meats[1]		Food Animals
***Campylobacter* Species**	**Humans (N=1478)**	**Retail Chicken (N=603)**	**Ground Turkey (N=31)**	**Chickens (N=577)**
C. jejuni	86.3% 1275	65.2% 393	41.9% 13	59.6% 344
C. coli	10.0% 148	34.8% 210	58.1% 18	40.4% 233
Other	3.7% 55	0.0% 0	0.0% 0	0.0% 0

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

Figure 18. *Campylobacter* Species Isolated from Humans, Retail Chicken, and Chickens, 2011



D. Antimicrobial Susceptibility among *Campylobacter jejuni*

MIC Distributions

Table 47a. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, 2011

Antimicrobial	Isolate Source (# of Isolates)[1]	%I[2]	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Aminoglycosides																			
Gentamicin	Humans (1275)	<0.1	**0.9**	[0.5 - 1.6]				3.4	33.7	59.1	2.7	0.2	<0.1				**0.9**		
	Retail Chicken (393)	0.0	**0.0**	[0.0 - 0.9]					10.4	80.4	8.9	0.3							
	Ground Turkey (13)	0.0	**0.0**	[0.0 - 24.7]				7.7		61.5	23.1	7.7							
	Chickens (344)	0.0	**0.3**	[0.0 - 1.6]				2.0	19.2	72.4	6.1						**0.3**		
Ketolides																			
Telithromycin	Humans (1275)	0.7	**1.9**	[1.2 - 2.8]	<0.1				0.9	8.5	38.0	40.0	10.0	0.7	**1.9**				
	Retail Chicken (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**				
	Ground Turkey (13)	0.0	**0.0**	[0.0 - 24.7]				7.7	23.1	38.5	7.7	23.1							
	Chickens (344)	0.3	**0.3**	[0.0 - 1.6]			0.3	1.5	27.9	47.7	19.5	2.6		0.3	**0.3**				
Lincosamides																			
Clindamycin	Humans (1275)	0.2	**1.8**	[1.1 - 2.7]			0.2	3.8	29.2	45.4	15.9	3.5	0.2	**0.2**	**0.3**	**1.3**			
	Retail Chicken (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**					
	Ground Turkey (13)	0.0	**0.0**	[0.0 - 24.7]			15.4	53.9	23.1	7.7									
	Chickens (344)	0.0	**0.3**	[0.0 - 1.6]		1.5	28.2	59.0	9.9	0.3	0.6	0.3		**0.3**					
Macrolides																			
Azithromycin	Humans (1275)	0.0	**1.7**	[1.1 - 2.6]		1.6	10.4	47.7	35.4	3.1		0.2						**1.7**	
	Retail Chicken (393)	0.0	**0.5**	[0.1 - 1.8]	8.4	56.7	29.8	4.3	0.3									**0.5**	
	Ground Turkey (13)	0.0	**0.0**	[0.0 - 24.7]	15.4	30.8	30.8	23.1											
	Chickens (344)	0.0	**0.6**	[0.1 - 2.1]	9.0	63.4	23.3	3.2	0.3	0.3								**0.6**	
Erythromycin	Humans (1275)	0.0	**1.7**	[1.1 - 2.6]				0.3	1.8	13.7	52.2	26.2	3.9	<0.1				**1.7**	
	Retail Chicken (393)	0.0	**0.5**	[0.1 - 1.8]			0.3	11.5	48.1	28.2	10.4	1.0						**0.5**	
	Ground Turkey (13)	0.0	**0.0**	[0.0 - 24.7]				15.4	46.2	30.8	7.7								
	Chickens (344)	0.0	**0.6**	[0.1 - 2.1]			0.6	13.4	45.3	33.7	5.8	0.3	0.3					**0.6**	
Phenicols																			
Florfenicol[6]	Humans (1275)	N/A	**2.1**	[1.4 - 3.1]			<0.1			0.9	27.0	60.1	9.9	**1.4**	**0.6**	**<0.1**			
	Retail Chicken (393)	N/A	**0.0**	[0.0 - 0.9]					0.3	39.2	55.2	5.1	0.3						
	Ground Turkey (13)	N/A	**0.0**	[0.0 - 24.7]						53.9	38.5		7.7						
	Chickens (344)	N/A	**0.0**	[0.0 - 1.1]					0.9	46.8	50.9	1.5							

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

[2] Percent of isolates with intermediate susceptibility

[3] Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

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

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

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

Table 47b. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, 2011

Antimicrobial	Isolate Source (# of Isolates) [1]	%I [2]	%R [3]	[95% CI] [4]	Distribution (%) of MICs (µg/ml) [5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Quinolones																			
Ciprofloxacin	Humans (1275)	0.2	**23.5**	[21.1 - 25.9]		0.4	19.5	45.3	9.1	1.6	0.4	0.2	**0.6**	**7.2**	**9.5**	**4.2**	**1.3**	**0.6**	
	Retail Chicken (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**	**3.1**	**0.5**		
	Ground Turkey (13)	0.0	**46.2**	[19.2 - 74.9]			15.4	38.5					**7.7**	**23.1**	**15.4**				
	Chickens (344)	0.0	**19.2**	[15.2 - 23.8]		0.6	47.7	27.6	4.4	0.3	0.3		**1.2**	**9.0**	**8.4**	**0.6**			
Nalidixic acid	Humans (1275)	0.4	**23.7**	[21.4 - 26.1]									61.5	12.6	1.8	0.4	**0.3**	**23.4**	
	Retail Chicken (393)	0.8	**20.9**	[17.0 - 25.2]									43.5	33.8	1.0	0.8	**8.4**	**12.5**	
	Ground Turkey (13)	0.0	**46.2**	[19.2 - 74.9]									46.2	7.7			**23.1**	**23.1**	
	Chickens (344)	1.2	**19.2**	[15.2 - 23.8]									65.7	14.0		1.2	**3.8**	**15.4**	
Tetracyclines																			
Tetracycline	Humans (1275)	0.2	**45.9**	[43.1 - 48.7]			0.2	2.4	24.8	18.3	6.1	1.3	0.9	0.2	**<0.1**	**0.5**	**1.8**	**43.5**	
	Retail Chicken (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**	
	Ground Turkey (13)	0.0	**92.3**	[64.0 - 99.8]					7.7						**7.7**	**7.7**	**53.9**	**23.1**	
	Chickens (344)	0.3	**45.1**	[39.7 - 50.5]			1.5	27.9	18.9	4.7	1.2	0.6		0.3	**1.7**	**4.1**	**18.0**	**21.2**	

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

[2] Percent of isolates with intermediate susceptibility

[3] Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

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

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

Table 48a. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	306	365	329	303	320	788	709	992	1042	1350	1158	1275
		Retail Chicken			198	325	510	403	426	332	329	404	355	393
		Ground Turkey			2	4	7	10	12	20	10	9	5	13
		Chickens		64[1]	526	374	508	567	228	166	78	117	208	344
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)[2]**	**Isolate Source[3]**												
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.1% 1	0.0% 0	0.7% 7	1.1% 11	0.6% 8	0.6% 7	0.9% 12
		Retail Chicken			0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.9% 1	0.5% 1	0.3% 1
Ketolides	Telithromycin (MIC ≥ 16 µg/ml)	Humans						0.5% 4	0.8% 6	1.0% 10	2.1% 22	1.3% 18	1.2% 14	1.9% 24
		Retail Chicken					0.4% 2	0.5% 2	0.7% 3	0.6% 2	0.3% 1	0.2% 1	0.8% 3	0.3% 1
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens						0.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
Lincosamides	Clindamycin (MIC ≥ 8 µg/ml)	Humans	0.7% 2	1.9% 7	1.8% 6	0.0% 0	2.2% 7	0.9% 7	1.0% 7	1.3% 13	2.0% 21	1.3% 17	1.2% 14	1.8% 23
		Retail Chicken					0.4% 2	0.5% 2	0.7% 3	0.6% 2	0.9% 3	0.5% 2	0.6% 2	0.3% 1
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.4% 2	0.8% 3	0.2% 1	0.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
Macrolides	Azithromycin (MIC ≥ 8 µg/ml)	Humans	1.6% 5	1.9% 7	1.8% 6	0.3% 1	0.6% 2	1.5% 12	0.8% 6	1.6% 16	2.2% 23	1.5% 20	1.1% 13	1.7% 22
		Retail Chicken					0.8% 4	0.5% 2	0.9% 4	0.6% 2	1.2% 4	1.0% 4	0.6% 2	0.5% 2
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		3.1% 2	0.6% 3	1.3% 5	1.6% 8	1.4% 8	0.4% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.6% 2
	Erythromycin (MIC ≥ 32 µg/ml)	Humans	1.0% 3	1.9% 7	1.2% 4	0.3% 1	0.3% 1	1.4% 11	0.8% 6	1.6% 16	2.2% 23	1.5% 20	1.1% 13	1.7% 22
		Retail Chicken			0.0% 0	0.0% 0	0.8% 4	0.5% 2	0.9% 4	0.6% 2	1.2% 4	1.0% 4	0.6% 2	0.5% 2
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		3.1% 2	0.6% 3	1.6% 6	1.2% 6	1.1% 6	0.4% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.6% 2
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.3% 1	0.3% 1	0.0% 0	1.6% 5							
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0							
	Florfenicol (MIC ≥ 8 µg/ml)[4]	Humans						0.4% 3	0.0% 0	0.0% 0	0.6% 6	0.6% 8	1.5% 17	2.1% 27
		Retail Chicken					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

[2] Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

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

[4] For florfenicol, only a susceptible breakpoint (≤ 4 µg/ml) has been established. In this report, isolates with an MIC ≥ 8 µg/ml are categorized as resistant

Table 48b. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	306	365	329	303	320	788	709	992	1042	1350	1158	1275
		Retail Chicken			198	325	510	403	426	332	329	404	355	393
		Ground Turkey			2	4	7	10	12	20	10	9	5	13
		Chickens		64[1]	526	374	508	567	228	166	78	117	208	344
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)[2]**	**Isolate Source[3]**												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	14.7% 45	18.4% 67	20.7% 68	17.2% 52	18.1% 58	21.3% 168	19.5% 138	25.8% 256	22.3% 232	23.0% 310	21.8% 252	23.5% 299
		Retail Chicken			15.2% 30	14.5% 47	15.1% 77	15.1% 61	16.7% 71	17.2% 57	14.6% 48	21.3% 86	22.5% 80	22.4% 88
		Ground Turkey			50.0% 1	0.0% 0	28.6% 2	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4	40.0% 2	46.2% 6
		Chickens		20.3% 13	18.6% 98	14.7% 55	21.3% 108	15.0% 85	8.8% 20	21.7% 36	32.1% 25	19.7% 23	23.1% 48	19.2% 66
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	16.0% 49	18.9% 69	21.3% 70	17.8% 54	18.4% 59	21.7% 171	19.0% 135	26.1% 259	22.7% 237	23.1% 312	21.9% 254	23.7% 302
		Retail Chicken					15.1% 77	14.9% 60	16.7% 71	17.2% 57	14.6% 48	21.3% 86	22.8% 81	20.9% 82
		Ground Turkey					28.6% 2	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4	40.0% 2	46.2% 6
		Chickens		20.3% 13	22.1% 116	15.5% 58	21.7% 110	15.3% 87	8.8% 20	21.7% 36	33.3% 26	19.7% 23	23.1% 48	19.2% 66
Tetracyclines	Doxycycline (MIC ≥ 8 µg/ml)	Retail Chicken			38.4% 76	40.6% 132								
		Ground Turkey			100.0% 2	75.0% 3								
	Tetracycline (MIC ≥ 16 µg/ml)	Humans	39.2% 120	40.3% 147	41.3% 136	38.3% 116	46.9% 150	41.8% 329	47.4% 336	44.8% 444	44.1% 460	43.4% 586	42.7% 495	45.9% 585
		Retail Chicken					50.2% 256	46.4% 187	47.2% 201	48.5% 161	49.8% 164	45.8% 185	36.3% 129	48.3% 190
		Ground Turkey					42.9% 3	70.0% 7	75.0% 9	90.0% 18	100.0% 10	100.0% 9	80.0% 4	92.3% 12
		Chickens		35.9% 23	45.1% 237	47.6% 178	42.3% 215	44.1% 250	56.1% 128	56.6% 94	53.8% 42	49.6% 58	47.6% 99	45.1% 155

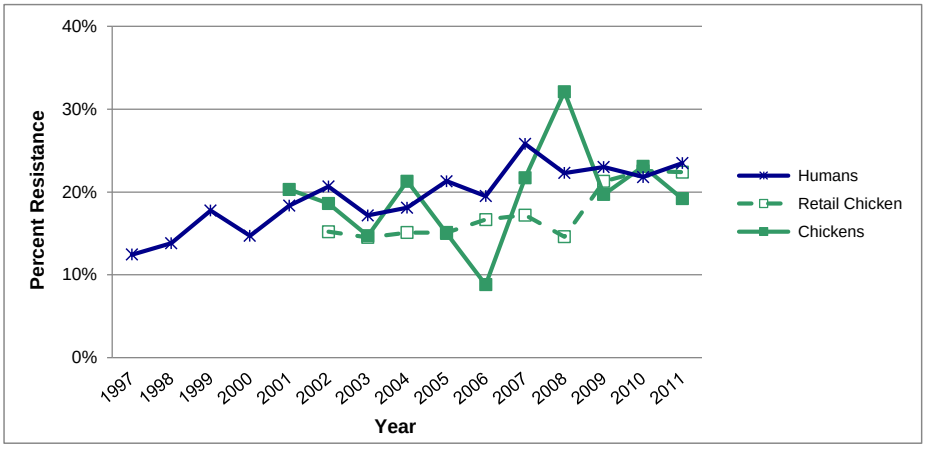
[1] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

[2] Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

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

Ciprofloxacin Resistance

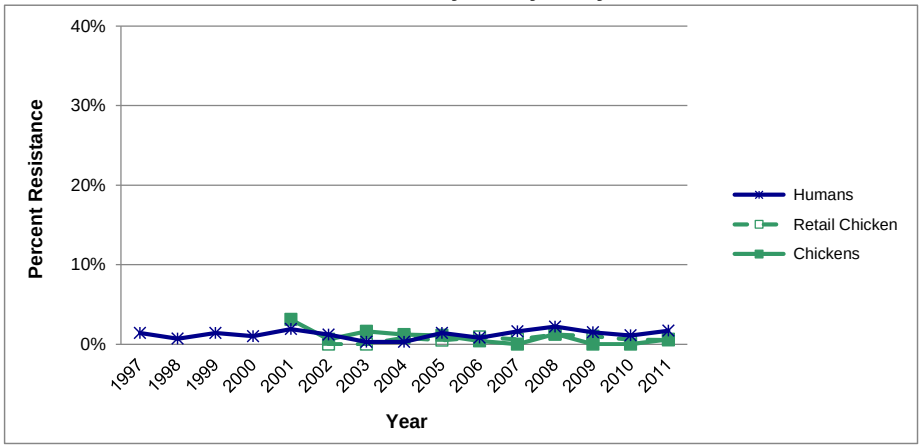
Figure 19. Percent of *Campylobacter jejuni* Isolates from Humans, Retail Chicken, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2011[1]



[1] Data for ground turkey are not included due to the small number of *C. jejuni* isolates from this source. Table 48 contains resistance data for *C. jejuni* isolates from each source, by year

Erythromycin Resistance

Figure 20. Percent of *Campylobacter jejuni* Isolates from Humans, Retail Chicken, and Chickens Resistant to Erythromycin by Year, 1997-2011[1]



[1] Data for ground turkey are not included due to the small number of *C. jejuni* isolates from this source. Table 48 contains resistance data for *C. jejuni* isolates from each source, by year

Table 49. Number of *Campylobacter jejuni* Isolates Tested from Humans, Retail Meats[1], and Chickens by Year, 1997-2011

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	209	297	293	306	365	329	303	320	788	709	992	1042	1350	1158	1275
Retail Chicken						198	325	510	403	426	332	329	404	355	393
Ground Turkey						2	4	7	10	12	20	10	9	5	13
Chickens					64[2]	526	374	508	567	228	166	78	117	208	344

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

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

E. Antimicrobial Susceptibility among *Campylobacter coli*

MIC Distributions

Table 50a. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, 2011

Antimicrobial	Isolate Source (# of Isolates)[1]	%I[2]	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Aminoglycosides																			
Gentamicin	Humans (148)	0.0	**12.2**	[7.4 - 18.5]					23.6	62.2	1.4	0.7				**0.7**	**11.5**		
	Retail Chicken (210)	0.0	**18.1**	[13.1 - 24.0]					1.4	55.7	24.8						**18.1**		
	Ground Turkey (18)	0.0	**0.0**	[0.0 - 18.5]						83.3	16.7								
	Chickens (233)	0.0	**5.6**	[3.0 - 9.4]					3.9	85.4	5.2						**5.6**		
Ketolides																			
Telithromycin	Humans (148)	7.4	**3.4**	[1.1 - 7.7]				1.4	8.1	23.6	8.1	20.3	27.7	7.4	**3.4**				
	Retail Chicken (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**				
	Ground Turkey (18)	0.0	**5.6**	[0.1 - 27.3]							33.3	50.0	11.1		**5.6**				
	Chickens (233)	0.4	**2.6**	[1.0 - 5.5]				2.1	16.7	10.3	43.3	24.0	0.4	0.4	**2.6**				
Lincosamides																			
Clindamycin	Humans (148)	0.7	**4.1**	[1.5 - 8.6]				2.0	21.6	31.1	28.4	12.2	0.7	**1.4**		**2.7**			
	Retail Chicken (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**					
	Ground Turkey (18)	0.0	**5.6**	[0.1 - 27.3]				16.7	55.6	16.7	5.6			**5.6**					
	Chickens (233)	2.1	**0.0**	[0.0 - 1.6]			2.1	45.9	44.6	4.3	0.4	0.4	2.1						
Macrolides																			
Azithromycin	Humans (148)	0.0	**2.7**	[0.7 - 6.8]		0.7	6.8	33.1	37.8	16.2	2.0	0.7						**2.7**	
	Retail Chicken (210)	0.0	**4.3**	[2.0 - 8.0]		17.6	58.6	18.6	1.0									**4.3**	
	Ground Turkey (18)	0.0	**5.6**	[0.1 - 27.3]		5.6	61.1	22.2	5.6									**5.6**	
	Chickens (233)	0.0	**3.4**	[1.5 - 6.7]	0.4	9.4	76.4	9.9				0.4						**3.4**	
Erythromycin	Humans (148)	0.0	**2.7**	[0.7 - 6.8]					3.4	22.3	23.6	25.7	18.9	3.4				**2.7**	
	Retail Chicken (210)	0.5	**4.8**	[2.3 - 8.6]				3.3	30.0	24.3	32.4	4.8			0.5			**4.8**	
	Ground Turkey (18)	0.0	**5.6**	[0.1 - 27.3]						27.8	50.0	11.1	5.6					**5.6**	
	Chickens (233)	0.0	**3.4**	[1.5 - 6.7]				3.9	19.7	37.3	34.3	1.3					**0.4**	**3.0**	
Phenicols																			
Florfenicol[6]	Humans (148)	N/A	**0.7**	[0.0 - 3.7]						0.7	15.5	58.1	25.0	**0.7**					
	Retail Chicken (210)	N/A	**0.0**	[0.0 - 1.7]						7.1	77.6	14.8	0.5						
	Ground Turkey (18)	N/A	**0.0**	[0.0 - 18.5]						5.6	66.7	27.8							
	Chickens (233)	N/A	**0.0**	[0.0 - 1.6]						9.4	86.3	4.3							

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

[2] Percent of isolates with intermediate susceptibility

[3] Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

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

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

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

Table 50b. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, 2011

Antimicrobial	Isolate Source (# of Isolates)[1]	%I[2]	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Quinolones																			
Ciprofloxacin	Humans (148)	0.0	**35.8**	[28.1 - 44.1]		0.7	3.4	30.4	17.6	11.5	0.7			**7.4**	**14.9**	**9.5**	**4.1**		
	Retail Chicken (210)	0.0	**18.1**	[13.1 - 24.0]			3.8	44.8	32.4	1.0				**3.8**	**11.0**	**3.3**			
	Ground Turkey (18)	0.0	**50.0**	[26.0 - 74.0]				33.3	16.7						**27.8**	**22.2**			
	Chickens (233)	0.0	**27.9**	[22.2 - 34.1]			12.0	47.6	12.4				**1.3**	**11.6**	**15.0**				
Nalidixic acid	Humans (148)	0.0	**35.8**	[28.1 - 44.1]									18.9	36.5	8.8			**35.8**	
	Retail Chicken (210)	1.0	**17.1**	[12.3 - 22.9]									25.7	53.8	2.4	1.0	**9.5**	**7.6**	
	Ground Turkey (18)	0.0	**50.0**	[26.0 - 74.0]									11.1	33.3	5.6		**38.9**	**11.1**	
	Chickens (233)	0.4	**27.5**	[21.8 - 33.7]									58.8	13.3		0.4	**18.9**	**8.6**	
Tetracyclines																			
Tetracycline	Humans (148)	0.0	**50.7**	[42.3 - 59.0]				1.4	17.6	20.9	6.8	2.7			**1.4**		**0.7**	**48.6**	
	Retail Chicken (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**	
	Ground Turkey (18)	0.0	**77.8**	[52.4 - 93.6]					5.6		11.1	5.6					**11.1**	**66.7**	
	Chickens (233)	0.0	**42.1**	[35.6 - 48.7]				4.7	32.6	10.7	9.4	0.4			**0.4**	**1.7**	**4.7**	**35.2**	

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

[2] Percent of isolates with intermediate susceptibility

[3] Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

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

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

Table 51a. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	12	17	25	22	26	99	97	105	110	142	116	148
		Retail Chicken Ground Turkey			90 2	142 1	196 5	151 9	145 10	143 14	181 19	176 16	148 7	210 18
		Chickens		52[1]	288	247	186	380	123	76	28	81	100	233
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)[2]**	**Isolate Source[3]**												
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans	8.3% 1	0.0% 0	0.0% 0	4.5% 1	0.0% 0	3.0% 3	1.0% 1	0.0% 0	1.8% 2	3.5% 5	12.1% 14	12.2% 18
		Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1	1.7% 3	5.7% 10	12.8% 19	18.1% 38
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0	1.3% 1	3.6% 1	2.5% 2	5.0% 5	5.6% 13
Ketolides	Telithromycin (MIC ≥ 16 µg/ml)	Humans						5.1% 5	7.2% 7	5.7% 6	6.4% 7	2.8% 4	5.2% 6	3.4% 5
		Retail Chicken					8.2% 16	7.9% 12	4.8% 7	7.0% 10	7.7% 14	4.5% 8	4.1% 6	3.8% 8
		Ground Turkey					0.0% 0	22.2% 2	0.0% 0	0.0% 0	5.3% 1	0.0% 0	0.0% 0	5.6% 1
		Chickens						5.5% 21	6.5% 8	13.2% 10	3.6% 1	6.2% 5	4.0% 4	2.6% 6
Lincosamides	Clindamycin (MIC ≥ 8 µg/ml)	Humans	8.3% 1	5.9% 1	4.0% 1	9.1% 2	0.0% 0	5.1% 5	9.3% 9	5.7% 6	10.0% 11	2.8% 4	6.9% 8	4.1% 6
		Retail Chicken					7.1% 14	8.6% 13	4.8% 7	4.9% 7	5.0% 9	3.4% 6	1.4% 2	1.0% 2
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.6% 1
		Chickens		1.9% 1	4.9% 14	4.5% 11	1.1% 2	2.4% 9	1.6% 2	9.2% 7	3.6% 1	0.0% 0	4.0% 4	0.0% 0
Macrolides	Azithromycin (MIC ≥ 8 µg/ml)	Humans	8.3% 1	5.9% 1	4.0% 1	9.1% 2	0.0% 0	4.0% 4	8.2% 8	5.7% 6	10.9% 12	3.5% 5	5.2% 6	2.7% 4
		Retail Chicken					9.2% 18	9.9% 15	5.5% 8	6.3% 9	9.9% 18	4.5% 8	4.1% 6	4.3% 9
		Ground Turkey					0.0% 0	22.2% 2	0.0% 0	0.0% 0	5.3% 1	0.0% 0	14.3% 1	5.6% 1
		Chickens		11.5% 6	19.4% 56	20.2% 50	9.1% 17	8.4% 32	8.9% 11	14.5% 11	10.7% 3	6.2% 5	4.0% 4	3.4% 8
	Erythromycin (MIC ≥ 32 µg/ml)	Humans	8.3% 1	5.9% 1	4.0% 1	9.1% 2	0.0% 0	4.0% 4	8.2% 8	5.7% 6	10.9% 12	3.5% 5	5.2% 6	2.7% 4
		Retail Chicken			7.8% 7	7.0% 10	9.2% 18	9.9% 15	5.5% 8	6.3% 9	9.9% 18	4.5% 8	4.1% 6	4.8% 10
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	22.2% 2	0.0% 0	0.0% 0	5.3% 1	0.0% 0	14.3% 1	5.6% 1
		Chickens		9.6% 5	18.8% 54	20.2% 50	9.1% 17	8.4% 32	8.9% 11	14.5% 11	10.7% 3	6.2% 5	4.0% 4	3.4% 8
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0							
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0							
	Florfenicol (MIC > 4 µg/ml)[4]	Humans						1.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1
		Retail Chicken					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

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

[2] Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

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

[4] For florfenicol, only a susceptible breakpoint (≤ 4 µg/ml) has been established. In this report, isolates with an MIC ≥ 8 µg/ml are categorized as resistant

Table 51b. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		Humans	12	17	25	22	26	99	97	105	110	142	116	148
		Retail Chicken			90	142	196	151	145	143	181	176	148	210
		Ground Turkey			2	1	5	9	10	14	19	16	7	18
		Chickens		52[1]	288	247	186	380	123	76	28	81	100	233
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)[2]**	**Isolate Source [3]**												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	25.0% 3	47.1% 8	12.0% 3	22.7% 5	30.8% 8	24.2% 24	21.6% 21	28.6% 30	30.9% 34	22.5% 32	31.9% 37	35.8% 53
		Retail Chicken			10.0% 9	13.4% 19	16.3% 32	29.1% 44	22.1% 32	25.9% 37	20.4% 37	18.2% 32	13.5% 20	18.1% 38
		Ground Turkey			50.0% 1	100.0% 1	0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	43.8% 7	57.1% 4	50.0% 9
		Chickens		19.2% 10	16.0% 46	20.2% 50	26.9% 50	22.1% 84	15.4% 19	15.8% 12	14.3% 4	22.2% 18	22.0% 22	27.9% 65
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	25.0% 3	47.1% 8	12.0% 3	22.7% 5	34.6% 9	27.3% 27	23.7% 23	30.5% 32	30.9% 34	23.9% 34	31.9% 37	35.8% 53
		Retail Chicken					16.3% 32	29.1% 44	20.7% 30	25.9% 37	20.4% 37	18.2% 32	13.5% 20	17.1% 36
		Ground Turkey					0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	43.8% 7	57.1% 4	50.0% 9
		Chickens		19.2% 10	17.7% 51	21.5% 53	27.4% 51	22.1% 84	15.4% 19	15.8% 12	14.3% 4	22.2% 18	22.0% 22	27.5% 64
Tetracyclines	Doxycycline (MIC ≥ 8 µg/ml)	Retail Chicken			44.4% 40	50.7% 72								
		Ground Turkey			50.0% 1	100.0% 1								
	Tetracycline (MIC ≥ 16 µg/ml)	Humans	25.0% 3	58.8% 10	40.0% 10	45.5% 10	38.5% 10	31.3% 31	39.2% 38	41.9% 44	40.0% 44	45.1% 64	49.1% 57	50.7% 75
		Retail Chicken					46.4% 91	42.4% 64	46.9% 68	39.9% 57	46.4% 84	38.1% 67	39.2% 58	49.0% 103
		Ground Turkey					0.0% 0	88.9% 8	80.0% 8	64.3% 9	94.7% 18	75.0% 12	100.0% 7	77.8% 14
		Chickens		57.7% 30	49.0% 141	51.0% 126	48.4% 90	42.1% 160	53.7% 66	42.1% 32	60.7% 17	44.4% 36	56.0% 56	42.1% 98

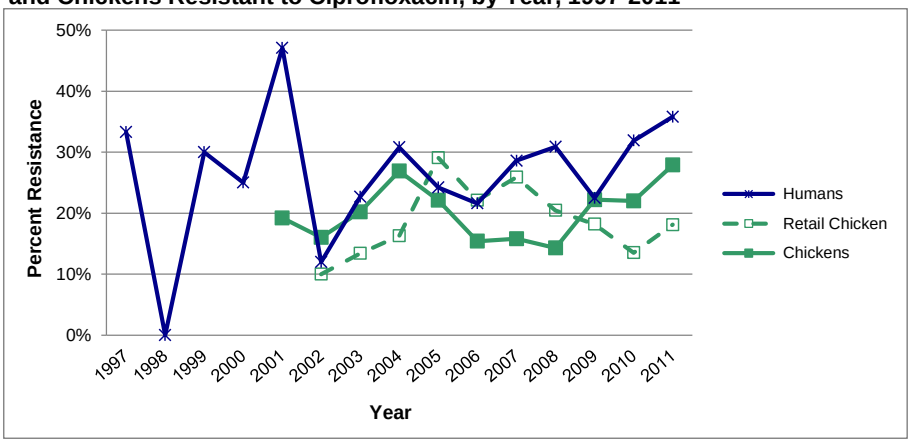
[1] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

[2] Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

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

Ciprofloxacin Resistance

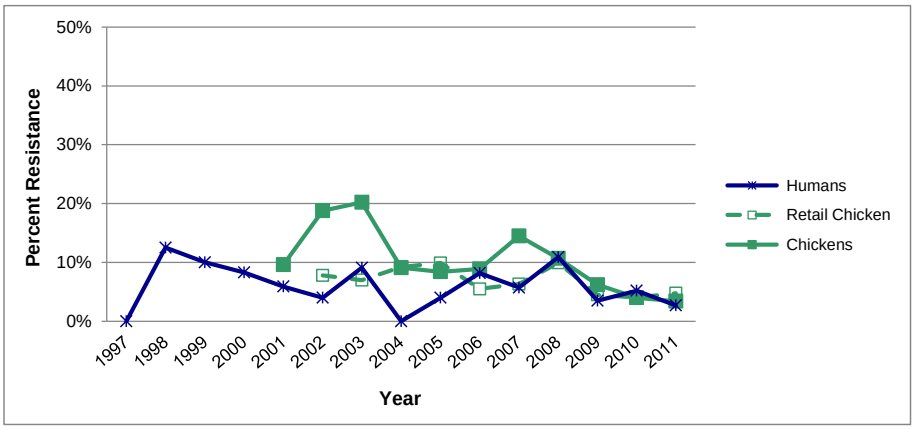
Figure 21. Percent of *Campylobacter coli* Isolates from Humans, Retail Chicken, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2011[1]



[1] Data for ground turkey are not included due to the small number of *C. coli* isolates from this source. Table 51 contains resistance data for *C . coli* isolates from each source, by year

Erythromycin Resistance

Figure 22. Percent of *Campylobacter coli* Isolates from Humans, Retail Chicken, and Chickens Resistant to Erythromycin, by Year, 1997-2011[1]



[1] Data for ground turkey are not included due to the small number of *C. coli* isolates from this source. Table 51 contains resistance data for *C. coli* isolates from each source, by year

Table 52. Number of *Campylobacter coli* Isolates Tested from Humans, Retail Meats[1], and Chickens, by Year, 1997-2011

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Humans	6	8	20	12	17	25	22	26	99	97	105	110	142	116	148
Chicken Breast						90	142	196	151	145	143	181	176	148	210
Ground Turkey						2	1	5	9	10	14	19	16	7	18
Chickens					52[2]	288	247	186	380	123	76	28	81	100	233

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

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

F. Multidrug Resistance among *Campylobacter* Species

Table 53a. Resistance Patterns among *Campylobacter* Species Isolate from Humans, Retail Meats and Food Animals by Year, 2004-2011

Year			2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	***C. jejuni***	Humans	N/A [1]	788	709	992	1042	1350	1158	1275
		Retail Chicken	510	403	426	332	329	404	355	393
		Ground Turkey	7	10	12	20	10	9	5	13
		Chickens	N/A [1]	567	228	166	78	117	208	344
	C. coli	Humans	N/A [1]	99	97	105	110	142	116	148
		Retail Chicken	196	151	145	143	181	176	148	210
		Ground Turkey	5	9	10	14	19	16	7	18
		Chickens	N/A [1]	380	123	76	28	81	100	233
Resistance Pattern	**Species**	**Isolate Source[1]**								
1. No Resistance Detected	***C. jejuni***	Humans		48.0% 380	43.7% 310	45.5% 451	46.1% 481	46.6% 630	47.2% 547	44.9% 573
		Retail Chicken	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	42.9% 3	30.0% 3	16.7% 2	10.0% 2	0.0% 0	0.0% 0	20.0% 1	0.0% 0
		Chickens		46.9% 266	39.9% 91	34.3% 57	33.3% 26	41.9% 49	44.7% 93	48.3% 166
	C. coli	Humans		51.0% 50	45.4% 44	40.0% 42	43.1% 47	43.7% 62	37.4% 43	35.8% 53
		Retail Chicken	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	100.0% 5	11.1% 1	20.0% 2	28.6% 4	5.3% 1	18.8% 3	0.0% 0	22.2% 14
		Chickens		47.6% 181	39.0% 48	43.4% 33	28.6% 8	49.4% 40	34.0% 34	42.1% 98
2. Resistance to ≥ 2 Antimicrobial Classes	***C. jejuni***	Humans		13.7% 108	11.6% 82	17.4% 173	14.6% 152	14.0% 189	13.2% 153	15.9% 203
		Retail Chicken	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	14.3% 1	10.0% 1	41.7% 5	30.0% 6	70.0% 7	44.4% 4	40.0% 2	38.5% 5
		Chickens		8.3% 47	5.3% 12	12.7% 21	23.1% 18	12.0% 14	15.9% 33	14.0% 48
	C. coli	Humans		14.3% 15	16.5% 17	18.1% 19	25.5% 28	16.2% 23	30.2% 35	35.1% 53
		Retail Chicken	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	0.0% 0	55.6% 5	30.0% 3	42.9% 6	52.6% 10	37.5% 6	57.1% 4	55.6% 10
		Chickens		21.6% 82	17.9% 22	21.1% 16	17.9% 5	19.8% 16	25.0% 25	18.5% 43
3. Resistance to ≥ 3 Antimicrobial Classes	***C. jejuni***	Humans		1.1% 9	0.7% 5	1.3% 13	2.7% 28	1.7% 23	1.9% 22	2.8% 36
		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	0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.5% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 2
	C. coli	Humans		6.1% 6	8.2% 8	5.7% 6	7.3% 8	2.8% 4	6.9% 8	6.1% 9
		Retail Chicken	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	0.0% 0	22.2% 2	0.0% 0	0.0% 0	5.3% 1	0.0% 0	14.3% 1	5.6% 1
		Chickens		5.8% 22	6.5% 8	13.2% 10	7.1% 2	6.2% 5	4.0% 4	4.3% 10

[1] Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

Table 53b. Resistance Patterns among *Campylobacter* Species Isolate from Humans, Retail Meats and Food Animals by Year, 2004-2011

Year			2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	***C. jejuni***	Humans	N/A [1]	788	709	992	1042	1350	1158	1275
		Retail Chicken	510	403	426	332	329	404	355	393
		Ground Turkey	7	10	12	20	10	9	5	13
		Chickens	N/A [1]	567	228	166	78	117	208	344
	C. coli	Humans	N/A [1]	99	97	105	110	142	116	148
		Retail Chicken	196	151	145	143	181	176	148	210
		Ground Turkey	5	9	10	14	19	16	7	18
		Chickens	N/A [1]	380	123	76	28	81	100	233
Resistance Pattern	**Species**	**Isolate Source[1]**								
4. Resistance to ≥ 4 Antimicrobial Classes	***C. jejuni***	Humans		0.5% 4	0.7% 5	1.0% 10	1.8% 19	1.2% 16	0.9% 11	1.7% 22
		Retail Chicken	0.4% 2	0.3% 1	0.7% 3	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0
		Ground Turkey	0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	C. coli	Humans		4.0% 4	5.2% 5	4.8% 5	5.5% 6	2.8% 4	5.2% 6	2.0% 3
		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	0.0% 0	22.2% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.6% 1
		Chickens		1.3% 5	0.8% 1	3.9% 3	0.0% 0	4.9% 4	0.0% 0	0.9% 2
5. At least Quinolone and Macrolide Resistant	***C. jejuni***	Humans		0.9% 7	0.6% 4	1.3% 13	1.4% 15	1.0% 14	0.8% 9	1.6% 21
		Retail Chicken	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
		Ground Turkey	0.0% 0	0.0% 0	0.0% 0	5.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.2% 1	0.4% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 0
	C. coli	Humans		2.0% 2	3.1% 3	1.9% 2	4.5% 5	2.8% 4	2.6% 3	2.0% 3
		Retail Chicken	0.5% 1	1.3% 2	0.0% 0	1.4% 2	1.1% 2	1.7% 3	0.7% 1	1.0% 2
		Ground Turkey	0.0% 0	22.2% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 1	0.0% 0
		Chickens		1.6% 6	1.6% 2	5.3% 4	0.0% 0	4.9% 4	0.0% 0	1.3% 3
6. At least Quinolone and Tetracycline Resistant	***C. jejuni***	Humans		4.0% 97	10.7% 76	17.0% 169	13.5% 141	13.3% 179	12.4% 144	14.6% 186
		Retail Chicken	6.3% 32	5.5% 22	8.0% 34	6.6% 22	6.1% 20	9.9% 40	10.7% 38	13.2% 52
		Ground Turkey	14.3% 1	10.0% 1	41.7% 5	30.0% 6	60.0% 6	44.4% 4	40.0% 2	38.5% 5
		Chickens		7.2% 41	4.8% 11	12.7% 21	20.5% 16	11.0% 13	15.4% 32	13.4% 46
	C. coli	Humans		10.1% 10	10.3% 10	13.3% 14	18.2% 20	13.4% 19	18.1% 21	23.6% 35
		Retail Chicken	7.1% 14	11.3% 17	10.3% 15	14.7% 21	13.3% 24	8.0% 14	8.1% 12	10.0% 21
		Ground Turkey	0.0% 0	55.6% 5	30.0% 3	42.9% 6	47.4% 9	37.5% 6	57.1% 4	50.0% 9
		Chickens		13.9% 53	9.8% 12	10.5% 8	14.3% 4	16.0% 13	16.0% 16	12.0% 28

[1] Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

VI. *Escherichia coli* Data

A. *E. coli* Isolates Tested

Table 54. Number of *E. coli* Isolates Tested, by Source and Year, 2000-2011

Source	Year											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
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 Chops			184	218	232	205	182	152	146	147	183	146
Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614

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

Table 55. Number and Percent of Retail Meat Samples Culture Positive for *E. coli*, 2011

	Retail Chicken	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	480	480	480	480
Number Positive for *E. coli*	341	368	215	146
Percent Positive for *E. coli*	71.0%	76.7%	44.8%	30.4%

Figure 23. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2011

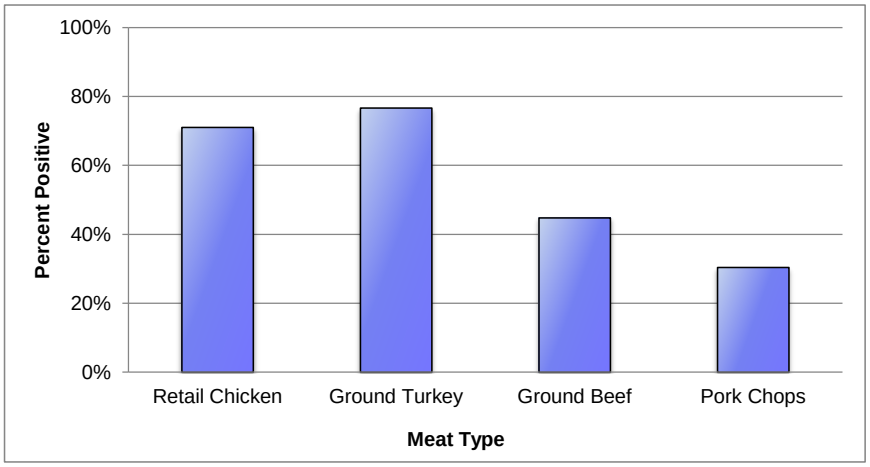
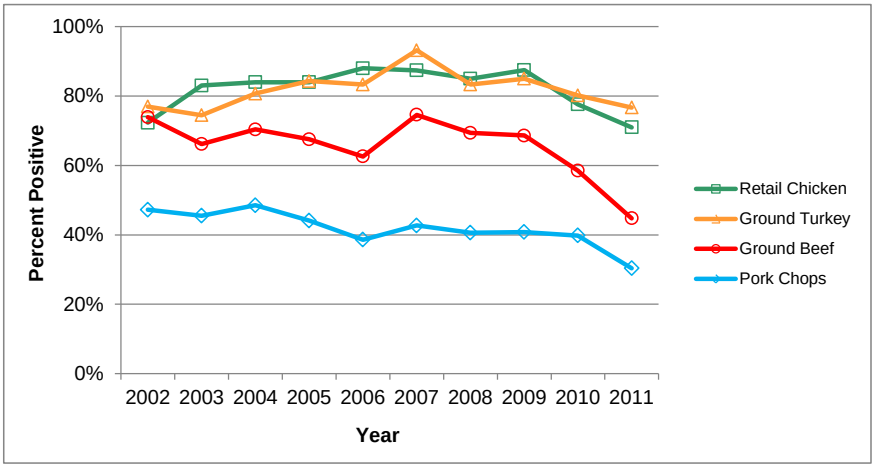


Figure 24. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2002-2011



C. Antimicrobial Susceptibility among *E. coli*

MIC Distributions

Table 56a. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 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
Aminoglycosides																					
Gentamicin	Retail Chicken (341)	0.9	**38.4**	[33.2 - 43.8]					0.3	29.6	28.5	1.8	0.6	0.9	**9.7**	**28.7**					
	Ground Turkey (368)	4.9	**32.6**	[27.8 - 37.7]						29.6	31.3	1.4	0.3	4.9	**8.7**	**23.9**					
	Ground Beef (215)	0.0	**0.5**	[0.0 - 2.6]						47.9	49.3	2.3			**0.5**						
	Pork Chops (146)	0.0	**0.7**	[0.0 - 3.8]					0.7	37.0	58.9	2.1	0.7		**0.7**						
	Chickens (614)	6.2	**42.8**	[38.9 - 46.9]					4.7	30.0	13.7	1.5	1.1	6.2	**20.0**	**22.8**					
Kanamycin	Retail Chicken (341)	0.6	**5.6**	[3.4 - 8.6]										89.7	4.1	0.6	**0.3**	**5.3**			
	Ground Turkey (368)	0.0	**24.7**	[20.4 - 29.5]										73.4	1.9			**24.7**			
	Ground Beef (215)	0.0	**1.4**	[0.3 - 4.0]										98.6				**1.4**			
	Pork Chops (146)	0.0	**1.4**	[0.2 - 4.9]										98.0	0.7			**1.4**			
	Chickens (614)	0.5	**5.7**	[4.0 - 7.8]										90.7	3.1	0.5	**0.2**	**5.5**			
Streptomycin	Retail Chicken (341)	N/A	**43.4**	[38.1 - 48.8]												56.6	**17.6**	**25.8**			
	Ground Turkey (368)	N/A	**60.3**	[55.1 - 65.4]												39.7	**27.2**	**33.2**			
	Ground Beef (215)	N/A	**6.5**	[3.6 - 10.7]												93.5	**3.7**	**2.8**			
	Pork Chops (146)	N/A	**15.1**	[9.7 - 21.9]												84.9	**6.9**	**8.2**			
	Chickens (614)	N/A	**50.8**	[46.8 - 54.8]												49.2	**20.4**	**30.5**			
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Retail Chicken (341)	0.3	**14.1**	[10.6 - 18.2]							2.6	22.3	44.6	16.1	0.3	**11.1**	**2.9**				
	Ground Turkey (368)	12.8	**13.0**	[9.8 - 16.9]							1.9	13.6	32.1	26.6	12.8	**9.5**	**3.5**				
	Ground Beef (215)	0.0	**0.5**	[0.0 - 2.6]							4.7	32.6	55.8	6.5		**0.5**					
	Pork Chops (146)	0.0	**0.0**	[0.0 - 2.5]							1.4	33.6	52.7	12.3							
	Chickens (614)	0.7	**9.4**	[7.3 - 12.0]							4.9	30.8	46.6	7.7	0.7	**8.5**	**1.0**				
Cephems																					
Cefoxitin	Retail Chicken (341)	1.2	**13.2**	[9.8 - 17.3]								13.2	61.9	10.6	1.2	**3.5**	**9.7**				
	Ground Turkey (368)	1.4	**12.5**	[9.3 - 16.3]							0.8	19.3	55.2	10.9	1.4	**1.9**	**10.6**				
	Ground Beef (215)	0.0	**0.5**	[0.0 - 2.6]							0.5	28.8	59.5	10.7			**0.5**				
	Pork Chops (146)	0.0	**0.0**	[0.0 - 2.5]								26.0	65.8	8.2							
	Chickens (614)	0.7	**9.1**	[7.0 - 11.7]							1.1	29.2	48.9	11.1	0.7	**4.7**	**4.4**				
Ceftiofur	Retail Chicken (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**						
	Ground Turkey (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**						
	Ground Beef (215)	0.0	**0.9**	[0.1 - 3.3]				4.2	44.2	50.2	0.5			**0.5**	**0.5**						
	Pork Chops (146)	0.0	**0.0**	[0.0 - 2.5]				4.1	50.0	45.9											
	Chickens (614)	2.4	**6.8**	[5.0 - 9.1]				2.1	47.6	39.6	1.0	0.5	2.4	**4.9**	**2.0**						

[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 the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 56b. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 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
Cephems																					
Ceftriaxone	Retail Chicken (341)	0.0	**12.6**	[9.3 - 16.6]					85.9	0.3	1.2			**2.9**	**9.1**	**0.6**					
	Ground Turkey (368)	0.5	**10.1**	[7.2 - 13.6]					87.0	0.3	2.2	0.5		**2.2**	**6.8**	**1.1**					
	Ground Beef (215)	0.0	**0.5**	[0.0 - 2.6]					99.1	0.5					**0.5**						
	Pork Chops (146)	0.0	**0.0**	[0.0 - 2.5]					100.0												
	Chickens (614)	0.3	**9.3**	[7.1 - 11.9]					89.9	0.5		0.3	**0.7**	**5.7**	**2.4**	**0.3**	**0.2**				
Folate Pathway Inhibitors																					
Sulfisoxazole	Retail Chicken (341)	N/A	**44.3**	[38.9 - 49.7]											39.9	14.1	1.5		0.3	**44.3**	
	Ground Turkey (368)	N/A	**51.9**	[46.7 - 57.1]											29.9	17.4	0.8			**51.9**	
	Ground Beef (215)	N/A	**7.9**	[4.7 - 12.4]											67.9	21.9	0.9	0.9	0.5	**7.9**	
	Pork Chops (146)	N/A	**10.3**	[5.9 - 16.4]											72.6	15.8		1.4		**10.3**	
	Chickens (614)	N/A	**54.7**	[50.7 - 58.7]											35.8	9.0	0.5			**54.7**	
Trimethoprim-Sulfamethoxazole	Retail Chicken (341)	N/A	**2.3**	[1.0 - 4.6]				77.4	15.0	3.5	1.2	0.6		**2.3**							
	Ground Turkey (368)	N/A	**4.3**	[2.5 - 7.0]				70.1	19.3	4.6	1.1	0.5		**4.4**							
	Ground Beef (215)	N/A	**2.3**	[0.8 - 5.3]				94.4	3.3					**2.3**							
	Pork Chops (146)	N/A	**3.4**	[1.1 - 7.8]				89.0	6.2	1.4			**0.7**	**2.7**							
	Chickens (614)	N/A	**4.2**	[2.8 - 6.1]				76.9	10.4	3.9	3.9	0.7	**0.2**	**4.1**							
Macrolides																					
Azithromycin	Retail Chicken (341)	0.0	**0.0**	[0.0 - 1.1]						0.3	0.9	22.0	71.0	5.9							
	Ground Turkey (368)	0.3	**0.3**	[0.0 - 1.5]						0.3	2.2	27.2	63.3	6.5	0.3	**0.3**					
	Ground Beef (215)	0.5	**0.0**	[0.0 - 1.7]							0.5	12.6	69.3	17.2	0.5						
	Pork Chops (146)	0.7	**0.0**	[0.0 - 2.5]							2.7	21.2	61.6	13.7	0.7						
	Chickens (614)	0.5	**0.2**	[0.0 - 0.9]							1.3	28.5	61.7	7.8	0.5	**0.2**					
Penicillins																					
Ampicillin	Retail Chicken (341)	0.0	**26.4**	[21.8 - 31.4]							8.5	43.1	21.4	0.6			**26.4**				
	Ground Turkey (368)	0.0	**51.6**	[46.4 - 56.8]							4.6	31.3	12.0	0.5		**0.5**	**51.1**				
	Ground Beef (215)	0.0	**3.7**	[1.6 - 7.2]							12.6	55.8	27.4	0.5			**3.7**				
	Pork Chops (146)	0.0	**13.0**	[8.0 - 19.6]							11.0	46.6	28.1	1.4			**13.0**				
	Chickens (614)	0.2	**16.0**	[13.2 - 19.1]							13.4	51.5	18.6	0.3	0.2	**0.5**	**15.5**				
Phenicols																					
Chloramphenicol	Retail Chicken (341)	0.0	**1.2**	[0.3 - 3.0]								5.9	59.2	33.7			**1.2**				
	Ground Turkey (368)	0.5	**4.9**	[2.9 - 7.6]								3.5	54.1	37.0	0.5		**4.9**				
	Ground Beef (215)	0.0	**1.4**	[0.3 - 4.0]								2.3	43.3	53.0			**1.4**				
	Pork Chops (146)	0.0	**2.7**	[0.8 - 6.9]								8.2	45.9	43.2		**1.4**	**1.4**				
	Chickens (614)	0.3	**2.1**	[1.1 - 3.6]								7.3	63.0	27.2	0.3		**2.1**				

[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 56c. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 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
Quinolones																					
Ciprofloxacin	Retail Chicken (341)	0.0	**0.0**	[0.0 - 1.1]	96.8	0.6		1.2	1.5												
	Ground Turkey (368)	0.0	**0.0**	[0.0 - 1.0]	95.4	2.7	0.3	1.6													
	Ground Beef (215)	0.0	**0.0**	[0.0 - 1.7]	100.0																
	Pork Chops (146)	0.0	**0.0**	[0.0 - 2.5]	100.0																
	Chickens (614)	0.0	**0.3**	[0.0 - 1.2]	96.1	1.6		1.0	1.0					**0.3**							
Nalidixic Acid	Retail Chicken (341)	N/A	**2.3**	[1.0 - 4.6]							19.1	71.9	6.5		0.3	**0.3**	**2.1**				
	Ground Turkey (368)	N/A	**1.6**	[0.6 - 3.5]						0.3	23.9	66.9	7.3				**1.6**				
	Ground Beef (215)	N/A	**0.0**	[0.0 - 1.7]							12.1	80.9	6.5	0.5							
	Pork Chops (146)	N/A	**0.0**	[0.0 - 2.5]						1.4	14.4	74.7	9.6								
	Chickens (614)	N/A	**2.3**	[1.3 - 3.8]						1.5	32.9	58.3	5.0			**0.8**	**1.5**				
Tetracyclines																					
Tetracycline	Retail Chicken (341)	1.2	**40.8**	[35.5 - 46.2]									58.1	1.2		**2.1**	**38.7**				
	Ground Turkey (368)	0.0	**79.9**	[75.4 - 83.9]									20.1		**0.8**	**4.6**	**74.5**				
	Ground Beef (215)	3.7	**17.7**	[12.8 - 23.4]									78.6	3.7	**1.9**	**2.3**	**13.5**				
	Pork Chops (146)	2.7	**46.6**	[38.3 - 55.0]									50.7	2.7		**5.5**	**41.1**				
	Chickens (614)	1.1	**46.6**	[42.6 - 50.6]									52.3	1.1	**2.4**	**11.1**	**33.1**				

[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 indicatethe range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 57a. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		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 Chops			184	218	232	205	182	152	146	147	183	146
		Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Retail Chicken			23.1% 65	29.3% 116	30.0% 120	37.7% 148	37.3% 156	34.4% 103	34.0% 104	34.3% 108	31.9% 114	38.4% 131
		Ground Turkey			27.0% 82	29.7% 99	29.3% 110	27.5% 109	29.6% 115	27.0% 85	37.0% 111	37.9% 116	24.9% 92	32.6% 120
		Ground Beef			0.3% 1	1.0% 3	0.6% 2	0.0% 0	4.1% 12	0.0% 0	2.0% 5	0.8% 2	0.4% 1	0.5% 1
		Pork Chops			1.1% 2	1.4% 3	1.3% 3	0.0% 0	1.1% 2	1.3% 2	1.4% 2	4.1% 6	2.7% 5	0.7% 1
		Chickens	40.0% 114	33.4% 664	38.0% 799	38.8% 530	39.1% 663	36.7% 819	33.1% 449	38.0% 574	44.5% 439	43.3% 380	43.0% 405	42.8% 263
	Kanamycin (MIC ≥ 64 µg/ml)	Retail Chicken			6.0% 17	6.8% 27	6.8% 27	7.1% 28	11.5% 48	9.0% 27	6.9% 21	5.4% 17	6.2% 22	5.6% 19
		Ground Turkey			13.2% 40	16.8% 56	16.0% 60	11.4% 45	14.7% 57	15.6% 49	19.0% 57	20.6% 63	21.4% 79	24.7% 91
		Ground Beef			2.4% 7	2.9% 9	2.4% 8	0.6% 2	4.7% 14	1.6% 4	4.0% 10	2.0% 5	3.7% 10	1.4% 3
		Pork Chops			5.4% 10	8.7% 19	8.2% 19	7.3% 15	6.0% 11	4.6% 7	6.2% 9	6.1% 9	7.7% 14	1.4% 2
		Chickens	16.1% 46	14.5% 288	11.6% 243	10.3% 140	11.5% 196	10.3% 231	9.1% 123	7.7% 117	10.2% 101	7.9% 69	6.4% 60	5.7% 35
	Streptomycin (MIC ≥ 64 µg/ml)	Retail Chicken			49.3% 139	56.1% 222	56.8% 227	50.6% 199	48.1% 201	46.8% 140	43.8% 134	38.1% 120	39.2% 140	43.4% 148
		Ground Turkey			57.6% 175	54.7% 182	49.2% 185	43.4% 172	43.8% 170	44.8% 141	57.3% 172	57.5% 176	47.7% 176	60.3% 222
		Ground Beef			9.5% 28	9.0% 28	11.8% 40	5.4% 17	14.2% 42	6.3% 16	10.4% 26	8.1% 20	9.3% 25	6.5% 14
		Pork Chops			22.3% 41	19.7% 43	21.1% 49	13.2% 27	13.7% 25	13.8% 21	19.9% 29	19.7% 29	19.7% 36	15.1% 22
		Chickens	77.5% 221	65.8% 1308	65.1% 1368	64.2% 877	64.1% 1088	58.0% 1295	49.5% 672	47.0% 710	54.6% 538	49.8% 437	49.1% 462	50.8% 312
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Retail Chicken			12.1% 34	13.6% 54	10.0% 40	12.2% 48	11.5% 48	7.4% 22	11.8% 36	13.3% 42	6.7% 24	14.1% 48
		Ground Turkey			5.6% 17	3.0% 10	5.3% 20	3.8% 15	6.7% 26	6.3% 20	8.3% 25	9.8% 30	10.0% 37	13.0% 48
		Ground Beef			2.0% 6	2.3% 7	3.9% 13	1.3% 4	2.4% 7	0.8% 2	2.4% 6	1.6% 4	1.1% 3	0.5% 1
		Pork Chops			5.4% 10	5.1% 11	5.6% 13	2.9% 6	2.2% 4	0.7% 1	3.4% 5	6.8% 10	2.2% 4	0.0% 0
		Chickens	8.1% 23	10.0% 199	10.9% 229	11.1% 151	8.8% 149	10.6% 236	16.0% 217	11.2% 169	13.7% 135	12.4% 109	12.4% 117	9.4% 58
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Retail Chicken			11.0% 31	9.3% 37	8.3% 33	11.2% 44	11.2% 47	7.4% 22	11.8% 36	13.3% 42	6.7% 24	13.2% 45
		Ground Turkey			3.3% 10	1.2% 4	4.5% 17	3.3% 13	6.2% 24	6.3% 20	6.3% 19	7.8% 24	9.2% 34	12.5% 46
		Ground Beef			1.4% 4	0.3% 1	1.2% 4	1.0% 3	2.0% 6	0.8% 2	2.4% 6	1.6% 4	1.1% 3	0.5% 1
		Pork Chops			3.3% 6	2.3% 5	2.2% 5	1.5% 3	1.6% 3	0.7% 1	3.4% 5	6.8% 10	0.5% 1	0.0% 0
		Chickens	7.4% 21	8.7% 173	8.5% 178	8.3% 113	8.2% 139	9.9% 221	15.0% 204	10.3% 155	13.8% 136	11.4% 100	12.5% 118	9.1% 56
	Ceftiofur (MIC ≥ 8 µg/ml)	Retail Chicken			7.1% 20	7.6% 30	5.8% 23	8.7% 34	8.6% 36	6.0% 18	10.8% 33	11.7% 37	5.6% 20	12.3% 42
		Ground Turkey			1.0% 3	0.3% 1	1.1% 4	1.8% 7	3.1% 12	6.0% 19	3.7% 11	6.2% 19	7.9% 29	9.8% 36
		Ground Beef			0.0% 0	0.3% 1	0.9% 3	0.6% 2	1.0% 3	0.8% 2	1.6% 4	0.8% 2	1.1% 3	0.9% 2
		Pork Chops			0.5% 1	0.9% 2	0.4% 1	0.0% 0	0.0% 0	0.7% 1	3.4% 5	6.8% 10	0.0% 0	0.0% 0
		Chickens	6.3% 18	4.4% 88	5.5% 115	7.1% 97	4.9% 83	6.5% 145	10.2% 139	7.0% 106	10.5% 103	9.5% 83	10.0% 94	6.8% 42
	Ceftriaxone (MIC ≥ 4 µg/ml)	Retail Chicken			7.8% 22	9.1% 36	6.5% 26	10.2% 40	9.1% 38	6.4% 19	11.1% 34	12.4% 39	6.4% 23	12.6% 43
		Ground Turkey			1.3% 4	0.3% 1	1.3% 5	2.3% 9	3.1% 12	6.0% 19	3.7% 11	6.9% 21	8.9% 33	10.1% 37
		Ground Beef			0.0% 0	0.3% 1	1.5% 5	1.9% 6	1.7% 5	0.8% 2	1.6% 4	0.8% 2	1.1% 3	0.5% 1
		Pork Chops			0.5% 1	0.9% 2	0.4% 1	0.5% 1	0.6% 1	0.7% 1	3.4% 5	6.8% 10	0.0% 0	0.0% 0
		Chickens	6.3% 18	7.6% 152	8.6% 181	9.4% 128	7.2% 122	9.0% 200	14.7% 199	10.3% 155	13.5% 133	11.5% 101	12.3% 116	9.3% 57
Folate Pathway Inhibitors	Sulfisoxazole[1] (MIC ≥ 512 µg/ml)	Retail Chicken			32.3% 91	38.4% 152	41.3% 165	48.1% 189	46.9% 196	42.1% 126	39.2% 120	40.6% 128	38.9% 139	44.3% 151
		Ground Turkey			48.0% 146	51.7% 172	48.4% 182	48.0% 190	48.5% 188	48.9% 154	51.0% 153	53.9% 165	44.7% 165	51.9% 191
		Ground Beef			9.8% 29	10.3% 32	13.0% 44	7.0% 22	12.5% 37	9.4% 24	11.6% 29	7.7% 19	12.6% 34	7.9% 17
		Pork Chops			12.5% 23	15.1% 33	19.4% 45	14.1% 29	20.3% 37	11.8% 18	16.4% 24	14.3% 21	16.4% 30	10.3% 15
		Chickens	57.9% 165	58.2% 1157	46.1% 969	43.9% 599	53.2% 903	51.9% 1159	48.6% 660	53.2% 804	52.7% 520	52.6% 461	51.8% 487	54.7% 336

Table 57b. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2011

Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested		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 Chops			184	218	232	205	182	152	146	147	183	146
		Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**												
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Retail Chicken			3.6% 10	7.1% 28	4.3% 17	7.4% 29	8.9% 37	5.0% 15	3.6% 11	2.2% 7	4.2% 15	2.3% 8
		Ground Turkey			4.0% 12	6.9% 23	3.7% 14	5.1% 20	8.0% 31	7.9% 25	5.3% 16	5.9% 18	5.1% 19	4.3% 16
		Ground Beef			0.7% 2	0.3% 1	0.6% 2	0.6% 2	1.4% 4	1.2% 3	2.0% 5	2.0% 5	0.7% 2	2.3% 5
		Pork Chops			1.1% 2	2.8% 6	3.9% 9	1.5% 3	2.2% 4	1.3% 2	6.2% 9	2.7% 4	3.8% 7	3.4% 5
		Chickens	17.2% 49	12.6% 251	10.4% 218	10.5% 144	10.7% 181	10.4% 232	8.4% 114	7.9% 120	9.1% 90	7.0% 61	6.4% 60	4.2% 26
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Retail Chicken												0.0% 0
		Ground Turkey												0.3% 1
		Ground Beef												0.0% 0
		Pork Chops												0.0% 0
		Chickens												0.2% 1
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Retail Chicken			21.6% 61	25.3% 100	17.0% 68	24.7% 97	20.1% 84	18.1% 54	23.5% 72	22.2% 70	16.5% 59	26.4% 90
		Ground Turkey			31.3% 95	35.7% 119	33.2% 125	38.1% 151	42.0% 163	48.3% 152	58.0% 174	56.2% 172	52.6% 194	51.6% 190
		Ground Beef			6.1% 18	5.1% 16	5.3% 18	3.5% 11	9.2% 27	6.6% 17	6.4% 16	4.9% 12	4.8% 13	3.7% 8
		Pork Chops			13.6% 25	13.3% 29	15.1% 35	16.1% 33	15.9% 29	15.8% 24	15.1% 22	11.6% 17	19.1% 35	13.0% 19
		Chickens	20.0% 57	19.5% 388	19.0% 399	18.6% 254	17.6% 298	22.0% 492	25.6% 347	18.7% 282	23.5% 232	19.8% 174	22.2% 209	16.0% 98
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Retail Chicken			0.7% 2	0.0% 0	1.8% 7	0.5% 2	2.6% 11	2.0% 6	1.0% 3	0.6% 2	1.4% 5	1.2% 4
		Ground Turkey			0.3% 1	3.6% 12	0.8% 3	4.0% 16	2.3% 9	2.9% 9	3.7% 11	3.3% 10	3.5% 13	4.9% 18
		Ground Beef			1.0% 3	2.3% 7	3.6% 12	1.6% 5	1.4% 4	3.9% 10	0.8% 2	2.4% 6	2.6% 7	1.4% 3
		Pork Chops			1.6% 3	4.1% 9	4.3% 10	3.4% 7	6.6% 12	3.9% 6	3.4% 5	4.8% 7	1.6% 3	2.7% 4
		Chickens	4.6% 13	2.4% 47	1.8% 38	1.3% 18	1.0% 17	1.0% 22	1.9% 26	2.3% 34	1.0% 10	1.1% 10	0.7% 7	2.1% 13
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Retail Chicken			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.3% 1	0.0% 0
		Ground Turkey			0.0% 0	0.3% 1	0.8% 3	0.0% 0	0.5% 2	0.3% 1	0.0% 0	0.7% 2	0.5% 2	0.0% 0
		Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Pork Chops			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	0.0% 0	0.2% 3	<0.1% 1	0.1% 1	0.2% 3	0.4% 8	0.0% 0	0.1% 1	0.6% 6	0.5% 4	0.2% 2	0.3% 2
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Retail Chicken			2.8% 8	4.0% 16	7.0% 28	6.6% 26	5.0% 21	3.0% 9	2.9% 9	2.9% 9	3.6% 13	2.4% 8
		Ground Turkey			4.3% 13	11.7% 39	10.6% 40	10.4% 41	5.2% 20	2.2% 7	3.7% 11	2.6% 8	2.7% 10	1.6% 6
		Ground Beef			0.0% 0	1.0% 3	1.5% 5	1.3% 4	0.7% 2	0.4% 1	0.4% 1	0.4% 1	0.0% 0	0.0% 0
		Pork Chops			0.5% 1	0.5% 1	0.0% 0	1.5% 3	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.5% 1	0.0% 0
		Chickens	10.2% 29	8.4% 168	6.8% 142	6.2% 84	6.8% 115	7.5% 168	5.4% 73	4.2% 64	6.0% 59	3.2% 28	3.4% 32	2.3% 14
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Retail Chicken			46.1% 130	42.9% 170	48.0% 192	46.6% 183	50.5% 211	40.5% 121	43.8% 134	41.6% 131	38.9% 139	40.8% 139
		Ground Turkey			77.0% 234	77.8% 259	74.2% 279	78.0% 309	76.5% 297	80.0% 252	85.7% 257	82.0% 251	69.4% 256	79.9% 294
		Ground Beef			30.9% 91	25.1% 78	22.8% 77	16.5% 52	25.4% 75	21.9% 56	24.0% 60	18.6% 62	22.7% 61	17.7% 38
		Pork Chops			52.7% 97	46.3% 101	56.0% 130	45.9% 94	52.7% 96	50.0% 76	54.8% 80	46.9% 69	44.3% 81	46.6% 68
		Chickens	68.4% 195	61.6% 1226	58.6% 1231	52.2% 713	50.3% 853	48.9% 1092	49.0% 665	40.2% 607	47.4% 467	49.1% 431	42.9% 404	46.6% 286

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

Table 58a. Resistance Patterns among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2011[1]

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	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 Chops			184	218	232	205	182	152	146	147	183	146
	Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614
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 Chops			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
	Chickens	10.2% 29	12.9% 257	15.9% 333	16.0% 219	17.0% 288	17.7% 395	18.6% 252	24.3% 367	20.9% 206	21.9% 192	21.5% 202	21.5% 132
2. Resistant to ≥ 3 Antimicrobial Classes	Retail Chicken			34.8% 98	38.9% 254	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	6.1% 13
	Pork Chops			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
	Chickens	55.1% 157	50.3% 1000	43.9% 921	39.2% 535	43.0% 729	41.5% 926	43.7% 593	36.7% 554	44.1% 435	41.4% 363	38.3% 360	37.3% 229
3. Resistant 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 Chops			4.4% 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
	Chickens	19.3% 55	16.1% 320	14.3% 300	13.8% 188	11.8% 200	14.9% 333	17.5% 137	13.6% 206	16.6% 164	14.5% 127	15.1% 142	11.7% 72
4. Resistant 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	6.4% 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 Chops			1.6% 3	2.8% 6	2.2% 5	1.5% 3	3.3% 6	1.3% 2	4.1% 6	5.4% 8	1.1% 2	0.0% 0
	Chickens	8.1% 23	8.1% 162	7.4% 155	7.2% 98	5.8% 98	7.6% 170	8.9% 121	7.1% 107	9.0% 89	7.5% 66	8.2% 77	6.5% 40
5. At Least ACSSuT[2] Resistant	Retail Chicken			0.4% 1	0.0% 0	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			0.0% 0	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	0.0% 0	0.0% 0	0.4% 1	0.9% 2
	Pork Chops			0.5% 1	1.4% 3	1.3% 3	1.0% 2	1.1% 2	0.7% 1	1.4% 2	2.0% 3	0.5% 1	0.0% 0
	Chickens	3.5% 10	2.0% 40	1.3% 27	1.0% 14	0.8% 14	0.6% 14	1.3% 18	1.7% 26	0.5% 5	0.2% 2	0.3% 3	0.7% 4

[1] Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), the 2011 antimicrobial class resistance data are comparable to the data from previous years.

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

Table 58b. Resistance Patterns among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2011

Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested	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 Chops			184	218	232	205	182	152	146	147	183	146
	Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614
Resistance Pattern	**Isolate Source**												
6. At Least ACT/S[1] Resistant	Retail Chicken			0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0% 0
	Ground Turkey			0.0% 0	0.9% 3	0.0% 0	0.8% 3	0.3% 1	0.3% 1	0.0% 0	0.3% 1	1.1% 4	0.0% 0
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Pork Chops			0.5% 1	0.0% 0	0.4% 1	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0	0.0% 0
	Chickens	1.4% 4	0.6% 11	0.3% 7	0.2% 3	0.3% 5	0.3% 7	0.2% 3	0.3% 4	0.3% 3	0.2% 2	0.0% 0	0.0% 0
7. At Least ACSSuTAuCx[2] Resistant	Retail Chicken			0.4% 1	0.0% 0	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			0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0	1.3% 4	1.3% 4	1.0% 3	1.1% 4	2.2% 8
	Ground Beef			0.0% 0	0.0% 0	0.9% 3	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0
	Pork Chops			0.0% 0	0.5% 1	0.4% 1	0.0% 0	0.0% 0	0.7% 1	0.7% 1	2.0% 3	0.0% 0	0.0% 0
	Chickens	2.8% 8	1.1% 22	0.8% 17	0.8% 11	0.6% 10	0.5% 11	1.0% 13	0.9% 14	0.4% 4	0.2% 2	0.3% 3	0.7% 4
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Retail Chicken			0.7% 2	0.5% 2	1.5% 6	0.3% 1	0.2% 1	0.0% 0	1.0% 3	1.0% 3	0.3% 1	0.0% 0
	Ground Turkey			0.3% 1	0.3% 1	0.3% 1	0.3% 1	0.0% 0	0.6% 2	0.0% 0	0.0% 0	0.0% 0	0.3% 1
	Ground Beef			0.0% 0	0.0% 0	0.3% 1	0.3% 1	0.3% 1	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0
	Pork Chops			0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Chickens	1.4% 4	0.3% 5	0.4% 9	0.9% 12	0.4% 7	0.7% 16	0.4% 5	0.6% 9	0.4% 4	0.6% 5	1.0% 9	0.5% 3

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

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

Table 59. Distribution of MICs and Occurrence of Resistance to Selected βeta-Lactam Agents among *E. coli* Isolates Resistant to Ceftiofur or Ceftriaxone from Retail Meats, and Chickens, 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 (2)	0.0	**0.0**	[0.0 - 84.2]								50.0	50.0								
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	0.0	**0.0**	[0.0 - 6.3]						1.8	15.8	61.4	21.1								
Cephems																					
Cefepime	Retail Chicken (43)	0.0	**0.0**	[0.0 - 8.2]				23.3	65.1	11.6											
	Ground Turkey (37)	0.0	**0.0**	[0.0 - 9.5]				8.1	64.9	27.0											
	Ground Beef (2)	0.0	**0.0**	[0.0 - 84.2]			50.0		50.0												
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	0.0	**0.0**	[0.0 - 6.3]			8.8	38.6	45.6	5.3	1.8										
Cefotaxime	Retail Chicken (43)	N/A	**97.7**	[87.7 - 99.9]								2.3	**4.7**	**72.1**	**20.9**						
	Ground Turkey (37)	N/A	**100.0**	[90.5 - 100.0]									**13.5**	**54.1**	**32.4**						
	Ground Beef (2)	N/A	**50.0**	[1.3 - 98.7]			50.0							**50.0**							
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	N/A	**93.0**	[83.0 - 98.1]			1.8	1.8		1.8		1.8	**35.1**	**45.6**	**10.5**	**1.8**					
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 (2)	0.0	**50.0**	[1.3 - 98.7]				50.0							**50.0**						
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	47.4	**42.1**	[29.1 - 55.9]				1.8	1.8				7.0	47.4	**36.8**	**5.3**					
Monobactam																					
Aztreonam	Retail Chicken (43)	46.5	**0.0**	[0.0 - 24.3]							2.3	2.3	48.8	46.5							
	Ground Turkey (37)	48.7	**5.4**	[0.7 - 43.8]								5.4	40.5	48.7	**5.4**						
	Ground Beef (2)	50.0	**0.0**	[0.0 - 91.4]			50.0							50.0							
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	10.5	**3.5**	[0.4 - 12.1]				3.5		1.8		19.3	61.4	10.5	**3.5**						
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 (2)	0.0	**0.0**	[0.0 - 84.2]				100.0													
	Pork Chops (0)	0.0	**N/A**	N/A																	
	Chickens (57)	0.0	**0.0**	[0.0 - 6.3]			7.0	61.4	28.1	3.5											

[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 the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Appendix A

Table A1. Concentration Ranges Used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli*, 2011

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

Table A2. Concentration Ranges Used for Antimicrobial Susceptibility Testing of *Campylobacter* , 2011

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

Table A3. Concentration Ranges Used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur, 2011

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	0.5 - 128
Cephems	Cefepime	0.125 - 32
	Cefotaxime	0.125 - 128
	Ceftazidime	0.125 - 128
Monobactams	Aztreonam	0.125 - 32
Penems	Imipenem	0.125 - 16

Appendix B

Table B1. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Salmonella* and *E. coli* Isolates, 1996-2011[1,2]

	Method	Broth Microdilution															
	Sensititre® Plate Name	CMV1CCDC[3] / CMV3CNCD	CMV3CNCD		CMV4CNCD	CMV5CNCD	CMV6CNCD	CMV7CNCD		CMV1AGNF							CMV2AGNF
	Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Antimicrobial Class	**Antimicrobial Agent**																
Aminocyclitols	Apramycin	√	√	√	√	√	√										
Aminoglycosides	Amikacin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
	Gentamicin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Kanamycin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Streptomycin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Cephems	Cefoxitin					√	√	√	√	√	√	√	√	√	√	√	√
	Ceftiofur	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Ceftriaxone	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Cephalothin	√	√	√	√	√	√	√	√								
Coumarins	Novobiocin	√															
Folate Pathway Inhibitors	Sulfamethoxazole	√	√	√	√	√	√	√	√								
	Sulfisoxazole									√	√	√	√	√	√	√	√
	Trimethoprim–Sulfamethoxazole	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin																√
Penems	Imipenem						√										
Penicillins	Ampicillin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Ticarcillin	√	√	√													
Phenicols	Chloramphenicol	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Florfenicol				√												
Quinolones	Ciprofloxacin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Nalidixic acid	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Tetracyclines	Tetracycline	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

[1] Testing of *Salmonella* isolates from humans, food animals, and retail meats began in 1996, 1997, and 2002, respectively

[2] Testing of *E. coli* isolates from chickens and retail meats began in 2000 and 2002, respectively. Testing of *E. coli* O157 isolates from humans began in 1996 and a study of *E. coli* isolates from people in the community began in 2004

[3] In 1996, most isolates were tested using Sensititre® plate CMV1CCDC, but a few isolates were tested using Sensititre® plate CMV3CNCD

Table B2. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Campylobacter* Isolates from Humans and Chickens, 1997-2011[1]

	Method		E-Test®								Broth Microdilution Sensititre® Plate: CAMPY						
	Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Antimicrobial Class	**Antimicrobial Agent**																
Aminoglycosides	Gentamicin			√	√	√	√	√	√	√	√	√	√	√	√	√	√
Ketolides	Telithromycin										√	√	√	√	√	√	√
Lincosamides	Clindamycin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin			√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Erythromycin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Penems	Meropenem																
Phenicols	Chloramphenicol		√	√	√	√	√	√	√	√							
	Florfenicol										√	√	√	√	√	√	√
Quinolones	Ciprofloxacin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Nalidixic acid		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Tetracyclines	Doxycycline																
	Tetracycline		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

[1] Testing of *Campylobacter* isolates from humans and chickens began in 1997 and 1998, respectively

Table B3. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Campylobacter* Isolates from Retail Meats, 2002-2011

	Method							Agar Dilution		Broth Microdilution Sensititre® Plate: CAMPY							
	Year							2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Antimicrobial Class	**Antimicrobial Agent**																
Aminoglycosides	Gentamicin							√	√	√	√	√	√	√	√	√	√
Ketolides	Telithromycin									√	√	√	√	√	√	√	√
Lincosamides	Clindamycin									√	√	√	√	√	√	√	√
Macrolides	Azithromycin									√	√	√	√	√	√	√	√
	Erythromycin							√	√	√	√	√	√	√	√	√	√
Penems	Meropenem							√	√								
Phenicols	Chloramphenicol																
	Florfenicol									√	√	√	√	√	√	√	√
Quinolones	Ciprofloxacin							√	√	√	√	√	√	√	√	√	√
	Nalidixic acid									√	√	√	√	√	√	√	√
Tetracyclines	Doxycycline							√	√								
	Tetracycline									√	√	√	√	√	√	√	√

Table B4. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *ESBL* Producing Isolates, 2011

	Method																	Broth Microdilution
	Sensititre® Plate Name																	CMV2DW
	Year																	2011
Antimicrobial Class	**Antimicrobial Agent**																	
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam																	√
Cephems	Cefepime																	√
	Cefotaxime																	√
	Ceftazidime																	√
Monabactams	Aztreonam																	√
Penems	Imipenem																	√

Appendix C

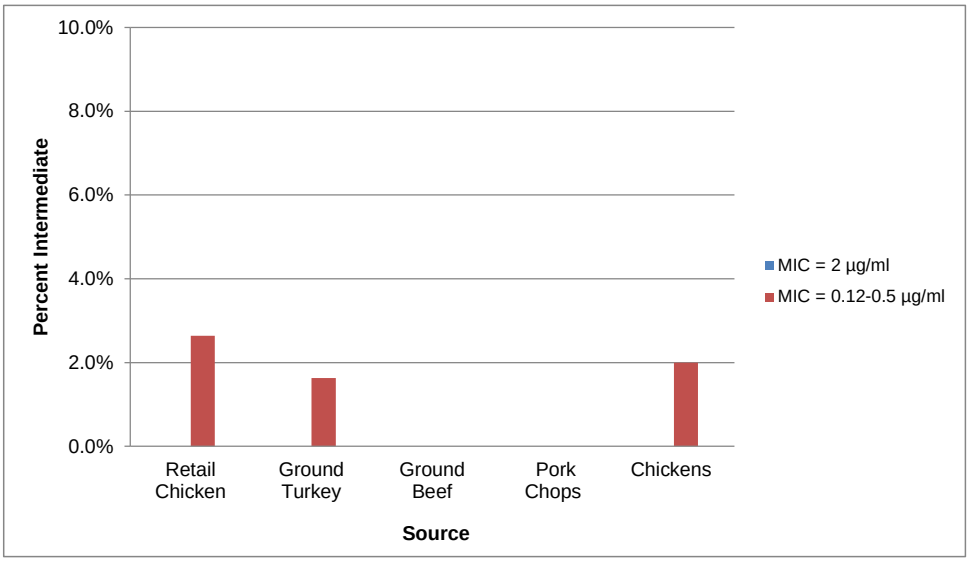
Table C. *E. coli* Isolates from Retail Meats and Chickens at Slaughter with Intermediate Susceptibility and Resistance to Ciprofloxacin, by Year, 2000-2011

Retail Meats					Food Animals				
Meat Type	Current Breakpoints [1]		New Breakpoints [2]		Meat Type	Current Breakpoints [1]		New Breakpoints [2]	
Year (N)	%I	%R	%I	%R	Year (N)	%I	%R	%I	%R
Retail Chicken					**Chickens**				
2002 (282)	0.4	0.0	2.1	0.7	2000 (285)	0.0	0.0	9.5	0.4
2003 (396)	0.0	0.0	4.0	0.0	2001 (1989)	0.0	0.2	7.3	0.4
2004 (400)	0.0	0.0	7.0	0.0	2002 (2100)	0.0	<0.1	5.8	0.3
2005 (393)	0.0	0.0	8.7	0.0	2003 (1365)	0.0	0.1	5.6	0.2
2006 (418)	0.0	0.0	4.8	0.0	2004 (1697)	0.0	0.2	6.1	0.2
2007 (299)	0.0	0.0	3.0	0.0	2005 (2232)	<0.1	0.4	7.0	0.5
2008 (306)	0.0	0.0	3.3	0.0	2006 (1357)	0.0	0.0	5.2	0.1
2009 (315)	0.0	0.3	2.5	0.3	2007 (1510)	0.0	0.1	4.0	0.1
2010 (357)	0.0	0.3	3.1	0.6	2008 (986)	0.0	0.6	5.2	0.6
2011 (341)	0.0	0.0	2.6	0.0	2009 (877)	0.0	0.5	2.5	0.5
					2010 (941)	0.0	0.2	3.2	0.2
					2011 (614)	0.0	0.3	2.0	0.3
Ground Turkeys									
2002 (304)	0.0	0.0	3.6	0.7					
2003 (333)	0.0	0.3	11.7	0.3					
2004 (376)	0.0	0.8	10.6	0.8					
2005 (396)	0.0	0.0	12.6	0.0					
2006 (388)	0.0	0.5	4.9	0.5					
2007 (315)	0.0	0.3	1.0	0.3					
2008 (300)	0.0	0.0	4.0	0.0					
2009 (306)	0.0	0.7	2.0	0.7					
2010 (369)	0.0	0.5	2.4	0.5					
2011 (368)	0.0	0.0	1.6	0.0					
Ground Beef									
2002 (295)	0.0	0.0	0.0	0.0					
2003 (311)	0.0	0.0	1.0	0.0					
2004 (338)	0.0	0.0	1.8	0.0					
2005 (316)	0.0	0.0	3.5	0.3					
2006 (295)	0.0	0.0	0.7	0.0					
2007 (256)	0.0	0.0	0.8	0.0					
2008 (250)	0.0	0.0	0.4	0.0					
2009 (247)	0.0	0.0	0.4	0.0					
2010 (269)	0.0	0.0	0.0	0.0					
2011 (215)	0.0	0.0	0.0	0.0					
Pork Chops									
2002 (184)	0.0	0.0	0.0	0.0					
2003 (218)	0.0	0.0	0.5	0.0					
2004 (232)	0.0	0.0	0.9	0.0					
2005 (205)	0.0	0.0	2.9	0.0					
2006 (182)	0.0	0.0	0.6	0.0					
2007 (152)	0.0	0.0	0.0	0.0					
2008 (146)	0.0	0.0	0.0	0.0					
2009 (147)	0.0	0.0	0.0	0.0					
2010 (183)	0.0	0.0	0.6	0.0					
2011 (146)	0.0	0.0	0.0	0.0					

[1] The breakpoints used for ciprofloxacin in this report are: Resistant (R) MIC≥4 µg/ml, Intermediate (I) MIC=2 µg/m

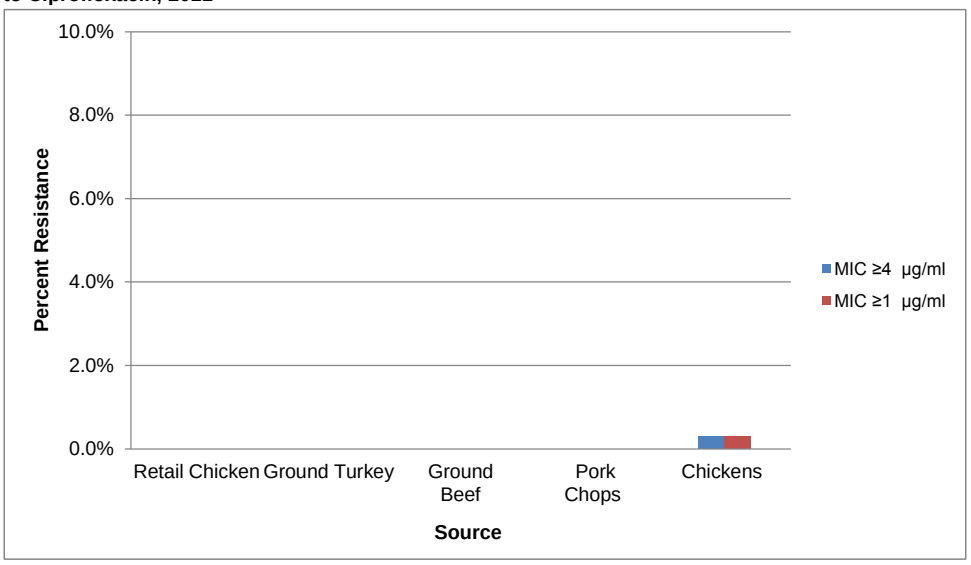
[2] The new breakpoints that will be used for ciprofloxacin in 2012 NARMS Reports are: Resistance (R) MIC ≥1 µg/ml, Intermediate (I) MIC=0.12-0.5 µg/ml

Figure C1. Percentage of *E. coli* Isolates from Retail Meats and Chickens at Slaughter with Intermediate Susceptibility to Ciprofloxacin, 2011[1]



[1]The intermdiate breakpoint used for ciprofloxacin in this report is 2 µg/ml. The new intermediate breakpoint of 0.12-0.5 µg/ml will be used in NARMS 2012 Reports

Figure C2. Percentage of *E. coli* Isolates from Retail Meats and Chickens at Slaughter Resistant to Ciprofloxacin, 2011[1]



[1]The intermdiate breakpoint used for ciprofloxacin in this report is 2 µg/ml. The new resistant breakpoint of ≥1 µg/ml will be used in NARMS 2012 Reports