National Antimicrobial Resistance Monitoring System: Enteric Bacteria

NARMS

2007

Animal Arm Annual Report

BEAR
Bacterial Epidemiology and Antimicrobial Resistance

USDA ARS

Table of Contents

I. Introduction

In an effort to prospectively monitor the emergence of antimicrobial resistance in zoonotic pathogens, the National Antimicrobial Resistance Monitoring System (NARMS) was established in 1996 by the Food and Drug Administration's Center for Veterinary Medicine in collaboration with the Centers for Disease Control and Prevention, and the United States Department of Agriculture (USDA).

The animal component of NARMS is housed within the Bacterial Epidemiology and Antimicrobial Resistance Research Unit (BEAR) of the USDA's Agricultural Research Service in Athens, Georgia. The animal component of NARMS comprises the testing of isolates obtained from diagnostic animal specimens, healthy on-farm animals, and food-producing animals at slaughter. The majority of isolates originate from the USDA Food Safety and Inspection Service (FSIS) and USDA Animal and Plant Health Inspection Service programs in addition to internal, collaborator and veterinary diagnostic laboratory studies.

The antimicrobial agents selected for study are representative of common antimicrobials used in both human and veterinary medicine and are selected primarily based on therapeutic value, although molecular mechanisms of resistance or treatment patterns may also influence selection. Non-Typhi *Salmonella* was chosen as a sentinel organism of the NARMS program. Testing of *Campylobacter* isolates from animals began in 1998 while *Escherichia coli* was included in 2000.

This report summarizes 2007 data for *Salmonella*, *Campylobacter*, and *E. coli* isolates from food-producing animals at slaughter (chicken, turkey, cattle, and swine). Samples are obtained through USDA's FSIS Pathogen Reduction: Hazard Analysis and Critical Control Point verification testing program. Resistance trends are included; however, due to the amount of data and complexity of analyses involved, all permutations are not represented. Additional information on the animal component of NARMS including past annual reports, summary trend tables and graphs, as well as a new component for interactive data analysis can be found on the USDA's NARMS web page. Other analysis of a specific nature is available upon request.

The 2006 NARMS Executive Report contains additional background information on sampling and testing methodology for the human and retail arms of NARMS as well as summary data from all three components.

II. Sampling and Testing Methods

A. Samples

Salmonella was recovered and tested across four animal species (chicken (broiler), turkey, cattle (beef and dairy), and swine). Isolates were received from FSIS as part of their regulatory testing. Information related to FSIS collection and testing methodology can be found at http://www.fsis.usda.gov/Science/Laboratories_&_Procedures/index.asp. FSIS progress reports on *Salmonella* testing of selected raw meat and poultry products from 2006 through present can be accessed at http://origin-www.fsis.usda.gov/Science/Quarterly_*Salmonella*_Results/index.asp.

B. Isolation

Salmonella isolation from slaughter samples was conducted by FSIS at all three FSIS Regulatory Field Services Laboratories (Eastern (Athens, GA), Midwestern (St Louis, MO) and Western (Alameda, CA)) following the "Isolation and Identification of *Salmonella* from Meat, Poultry, and Egg" procedures as described in the Microbiology Laboratory Guidebook, section 4.[1] Isolates were forwarded by FSIS to National Veterinary Services Laboratories, Ames, IA (NVSL) for serotyping. Serotype results were subsequently sent to the BEAR unit as they became available.

From 1998 to 2000, *Campylobacter* was isolated by all FSIS laboratories as part of the chicken monitoring baseline programs using the method described in the FSIS Microbiology Laboratory Guidebook[2]. Upon presumptive identification, isolates were sent to BEAR for final confirmation and susceptibility testing as described below. Upon review of susceptibility data and isolation methods, it was determined that use of nalidixic acid as part of the culture selection criteria may have resulted in recovery of isolates more likely to be resistant to quinolones. A comparative study was initiated by BEAR in 2001.

For the first half of 2001, BEAR pilot tested several isolation methods for *Campylobacter* until settling on a new method that was adopted in July which involved concentrating spent carcass rinsate prior to culture. Since that time, only rinsates from the FSIS Eastern Lab containing $\geq$10 ml were used. Thus, all rinsates tested for *Salmonella* were not processed for *Campylobacter* or *E. coli*. Also important to note is that as the FSIS *Campylobacter* baseline testing stopped, rinsates were no longer temperature controlled during shipment.

BEAR started isolating generic *E. coli* from these same rinsates in 2000. For *E. coli*, a sample of the rinsate was pre-enriched overnight before streaking onto a CHROMAgar™ ECC plate (DRG International; Mountainside, NJ). Plates were incubated as described by the manufacturer. Blue-green colonies,

---

[1] USDA/FSIS. 2004. Isolation and Identification of *Salmonella* from Meat, Poultry, and Egg Products. Microbiological Lab Guidebook 4.03. Available at http://www.fsis.usda.gov/PDF/MLG_4_03.pdf.

[2] USDA/FSIS. 1998. Isolation, Identification, And Enumeration Of Campylobacter jejuni/coli From Meat And Poultry Products. Microbiology Laboratory Guidebook, chapter 6. Available at http://www.fsis.usda.gov/ophs/Microlab/Mlgchp6.pdf.

typical of *E. coli,* were selected for susceptibility testing and confirmed as *E. coli* using the Vitek (bioMérieux, Inc; Durham, NC).

C. *Campylobacter* Identification

Final confirmation and speciation of *Campylobacter* isolates were obtained using the *Campylobacter* BAX® PCR System (DuPont Qualicon; Wilmington, DE). This multiplex assay, specific for *C. coli* and *C. jejuni*, was performed according to manufacturer's directions as previously described.[3]

D. Antimicrobial Susceptibility

In 2007, *Salmonella*, *Campylobacter*, and *E. coli* were tested using a semi-automated system (Sensitire®, Trek Diagnostic Systems, Inc., Westlake, Ohio) and a custom panel (catalog no. CMV1AGNF for *Salmonella* and *E. coli;* catalog no. CAMPY for *Campylobacter*) to determine the minimum inhibitory concentration (MIC) to antimicrobials important in both human and veterinary medicine. Tables 1 and 2 list antimicrobials tested, including their breakpoints for *Salmonella*/*E. coli* and *Campylobacter*, respectively. From 1998-2004, MICs for *Campylobacter* isolates were determined using Etest® (AB Biodisk; Solna, Sweden) as per manufacturer's direction, except MICs were not rounded up prior to categorization. In 2005, the animal component of NARMS switched to broth microdilution using the Sensititre system for *Campylobacter* as described above for *Salmonella* and *E. coli*. Regardless of the susceptibility testing method used, antimicrobial resistance was determined using Clinical and Laboratory Standards Institute (CLSI, formerly NCCLS) breakpoints, when available.[4,5] For antimicrobial agents without CLSI approved breakpoints, interpretive criteria as established by the NARMS working group were used.

Quality control strains used for *Salmonella* and *E. coli* testing included *E. coli* ATCC 25922, *Enterococcus faecalis* ATCC 29212, and *Staphylococcus aureus* ATCC 29213. *Campylobacter jejuni* ATCC 33560 was used for *Campylobacter* testing.

[3] Englen, M.D. and Paula J. Fedorka-Cray. 2002. Evaluation of a Commercial Diagnostic PCR for the Identification of *Campylobacter jejuni* and *Campylobacter coli*. Lett. Appl. Microbiol, 35:353-356.
[4] NCCLS/CLSI. 2002. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals. Approved Standard, M31-A2. NCCLS, Wayne, PA.
[5] CLSI. 2006. Performance Standards for Antimicrobial Susceptibility Testing; Sixteenth Informational Supplement (M100-S16). CLSI, Wayne, PA.

Table 1. Breakpoints Used for Susceptibility Testing of *Salmonella* and *E. coli*[1]

CLSI Subclass[2]	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
Aminoglycosides	Amikacin	≤ 16	32	≥ 64
	Gentamicin	≤ 4	8	≥ 16
	Kanamycin	≤ 16	32	≥ 64
	Streptomycin[3]	≤ 32	Not Applicable	≥ 64
Aminopenicillins	Ampicillin	≤ 8	16	≥ 32
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	≤ 8 / 4	16/8	≥ 32 / 16
Cephalosporins I	Cephalothin	≤ 8	16	≥ 32
Cephalosporins III	Ceftiofur	≤ 2	4	≥ 8
	Ceftriaxone	≤ 8	16 - 32	≥ 64
Cephamycins	Cefoxitin	≤ 8	16	≥ 32
Folate Pathway Inhibitors	Sulfonamides[4]	≤ 256	Not Applicable	≥ 512
	Trimethoprim–Sulfamethoxazole	≤ 2 / 38	Not Applicable	≥ 4 / 76
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
Fluoroquinolones	Ciprofloxacin	≤ 1	2	≥ 4
Quinolones	Nalidixic acid	≤ 16	Not Applicable	≥ 32
Tetracyclines	Tetracycline	≤ 4	8	≥ 16

[1] Breakpoints established by CLSI (Clinical and Laboratory Standards Institute) were used when available
[2] According to CLSI M100 document
[3] There are no CLSI breakpoints for streptomycin
[4] From 1997 through 2003, sulfamethoxazole was tested. Sulfisoxazole replaced sulfamethoxazole beginning in 2004

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

CLSI Subclass[2]	Antimicrobial Agent	Breakpoints (µg/ml) Etest (1998-2004)			Breakpoints (µg/ml) Broth Microdilution (2005-2007)		
		Susceptible	Intermediate	Resistant	Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	≤ 4	8	≥ 16	≤ 2	4	≥ 8
Lincosamides	Clindamycin	≤ 0.5	1 - 2	≥ 4	≤ 2	4	≥ 8
Macrolides	Azithromycin	≤ 0.25	0.5 - 1	≥ 2	≤ 2	4	≥ 8
	Erythromycin	≤ 0.5	1 - 4	≥ 8	≤ 8	16	≥ 32
Ketolides	Telithromycin	Not Tested	Not Tested	Not Tested	≤ 4	8	≥ 16
Phenicols	Florfenicol	Not Tested	Not Tested	Not Tested	≤ 4	Not Applicable	Not Applicable
	Chloramphenicol	≤ 8	16	≥ 32	Not Tested	Not Tested	Not Tested
Fluoroquinolones	Ciprofloxacin	≤ 1	2	≥ 4	≤ 1	2	≥ 4
Quinolones	Nalidixic acid	≤ 16	Not Applicable	≥ 32	≤ 16	32	≥ 64
Tetracyclines	Tetracycline	≤ 4	8	≥ 16	≤ 4	8	≥ 16

[1] Breakpoints established by CLSI (Clinical and Laboratory Standards Institute) were used when available. CLSI breakpoints are available only for erythromycin, ciprofloxacin, and tetracycline

[2] According to CLSI M100 document

E. Phage Typing

Salmonella Typhimurium and *S.* Typhimurium variant 5- (formally variant Copenhagen) isolates with resistance to at least ampicillin, chloramphenicol, sulfisoxazole and tetracycline were submitted to NVSL for phage typing.

III. Reporting Methods

WHONET 5, a microbiology laboratory database software, was used to categorize MICs as resistant, intermediate susceptibility (when applicable), and susceptible according to CLSI established interpretive criteria (when available). The 95% confidence interval was calculated using the Wilson interval with continuity correction method. MIC distributions as well as resistance and intermediate susceptibility percentages were tabulated by pathogen and food animal source. For *Salmonella*, MIC distributions were tabulated both on macro and micro levels. At the macro level, all *Salmonella* were analyzed for MIC distributions. At the micro level, isolates were grouped by serotype prior to analysis; results were tabulated for the top 11 serotypes from chicken, cattle and swine and for the top eight serotypes from turkey. MIC distributions were tabulated separately for *C. coli* and *C. jejuni*. Additionally, historical resistance percentages by food animal source and organism are presented from 1997 through 2007 for *Salmonella*, from 1998 through 2007 for *Campylobacter*, and from 2000 through 2007 for *E. coli*.

The frequency of *S.* Typhimurium showing resistance to at least ACSSuT (ampicillin, chloramphenicol, streptomycin, sulfisoxazole and tetracycline) or ACSuT (ampicillin, chloramphenicol, sulfisoxazole and tetracycline) as well as phage type distributions are reported separately for *S.* Typhimurium and *S.* Typhimurium variant 5- isolates. The frequency and percentage of confirmed *S.* Typhimurium DT104 isolates is reported separately by food animal source from 1997 through 2007.

Previously, multiple drug resistance (MDR) was defined as resistance to two or more antimicrobials regardless of subclass. In this report, MDR is reported as resistance to more than one CLSI subclass.

MDR tabulations for all pathogens were limited to only those antimicrobials tested for all years. The 14 core antimicrobials for *Salmonella* and *E. coli* were amikacin, gentamicin, kanamycin, streptomycin, ampicillin, amoxicillin/clavulanic acid, ceftiofur, ceftriaxone, chloramphenicol, sulfonamides (sulfamthoxazole/sulfisoxazole), trimethoprim/sulfamethoxazole, ciprofloxacin, nalidixic acid, and tetracycline. The seven core antimicrobials for *Campylobacter* were gentamicin, clindamycin, azithromycin, erythromycin, ciprofloxacin, nalidixic acid and tetracycline.

IV. Data Analysis

This report summarizes data collected as part of the animal component of NARMS.

A. *Salmonella*

The total number of *Salmonella* isolates tested by year since 1997 is shown in Table 1A.

The top 10 serotypes by commodity for 2007 are shown in Table 2A. Overall, Kentucky, Hadar, Montevideo and Derby ranked as the most prevalent serotype for chicken, turkey, cattle and swine, respectively. Using 2007 as the baseline, the relative distributions for the top five serotypes per commodity are shown in Figures 1A-4A. While Kentucky was the most frequently recovered serotype for chicken, the upward trend observed since 1997 appears to have halted in 2006, slightly declining in 2007 to 44.6% of isolates. Since 2002, an overall decline in Heidelberg has also been observed while Enteritidis increased starting in 2002 through 2006 and remained constant for 2007. Conversely, recovery of Typhimurium variant 5- (1997-2007), and I 4,[5],12:i:- (2004-2007) has remained relatively stable (Figure 1A).

The most remarkable change in serotype distribution occurred among isolates recovered from turkey (Figure 2A); Hadar increased from 13.1% in 2004 to 43.5% in 2007 while Heidelberg declined from 19.5% in 2004 to 8.5% in 2007. The decline in Heidelberg from turkey parallels the decline observed for chicken from 2002 to 2004. Overall, Heidelberg from turkey continued to decline from 2004 to 2007. From 2005 to 2007, Montevideo and Dublin increased in prevalence among cattle isolates while the other top serotypes remained relatively constant (Figure 3A). From 2005 to 2007, Derby decreased in prevalence among swine (Figure 4A) while slight increases were observed in Johannesburg from 2004 to 2007 and in Typhimurium from 2006 to 2007. Infantis and Typhimurium variant 5- showed little change.

The 2007 MIC distributions by antimicrobial and commodity for all *Salmonella* serotypes combined are shown in Table 3A. Because the distribution of serotypes between commodities varies greatly, it is important to determine resistance at the serotype and commodity level. It is not unusual for resistance to be driven by only a few serotypes.

The overall percent resistance by year, antimicrobial and commodity of all *Salmonella* is shown in Table 4A. These data provide a macro analysis on a yearly basis alerting analysts to any changes which may have taken place over time. Most notably, total percent resistance to gentamicin appears to be declining among chicken and turkey isolates. With the exception of one isolate from chicken in 2003, resistance has yet to emerge to ciprofloxacin while resistance to nalidixic acid remained very low ($\leq$2.0%) for all commodities except turkey. Resistance to the other antimicrobials varied by commodity.

A micro analysis of the data is presented in Tables 5A through 8A which shows total percent resistance and MIC distribution by commodity and top serotypes for 2007. Therefore, percent resistance can be evaluated independently by serotype. For instance, among serotypes from chicken *Salmonella* isolates, Enteritidis (n=124) was susceptible to 11 antimicrobials (amikacin, amoxicillin/clavulanic acid, cefoxitin, ceftiofur, ceftriaxone, chloramphenicol, ciprofloxacin, gentamicin, kanamycin, nalidixic acid and trimethoprim/sulfamethoxazole) and exhibited ≤2.4% resistance to ampicillin, streptomycin, sulfonamides or tetracycline. Conversely, Kentucky (n=443) was susceptible to three antimicrobials (amikacin, ciprofloxacin and trimethoprim/sulfamethoxazole) and exhibited varying levels of resistance to 12 antimicrobials (amoxicillin/clavulanic acid, ampicillin, cefoxitin, ceftiofur, ceftriaxone, chloramphenicol, gentamicin, kanamycin, nalidixic acid, streptomycin, sulfonamides and tetracycline).

Amikacin resistance was observed in only one *Salmonella* isolate from 2007, a *S.* Typhimurium from swine.

The frequency of *S.* Typhimurium including Typhimurium variant 5- exhibiting ACSSuT or ACSuT resistance patterns is shown in Table 9A. Although not streptomycin resistant, ACSuT isolates are often confirmed as DT104. Therefore, we believe this phenotype has clinical significance and should be reported.

Further, it is important to note that presentation of the ACSSuT or ACSuT pattern does not always confirm isolates as DT104 or its complex (Table 10A). Therefore, careful analysis of the data to the lowest denominator possible enables a more accurate assessment of the prevalence and importance of DT104 alone. Table 11A shows the prevalence of phage types among isolates with the ACSSuT phenotype. It is interesting to note the variability of phage types between Typhimurium and Typhimurium variant 5-.

Not all laboratories differentiate between Typhimurium and Typhimurium variant 5-. The data in Tables 9A through 11A illustrate the importance of making this differentiation. *Salmonella* Typhimurium variant 5- tends to present more frequently with the ACSSuT or ACSuT patterns and are more often confirmed as DT104 than the non-variant Typhimurium.

Overall, DT104 was most often recovered from swine followed by cattle, chicken and turkey (Table 12A).

MDR by commodity is presented in Tables 13A through 16A. These tables list data by CLSI subclass as well as by phenotypes thought to be of clinical importance in humans (at least ACSSuT, ACT/S, ACSSuTAuCf or ceftiofur and nalidixic acid resistance). Overall, pan-susceptible isolates most often originated (in order) from cattle, chicken, swine and turkey. Among the clinically important phenotypes reported, resistance was least often observed to ACT/S and to ceftiofur plus nalidixic acid, for all sources.

B. *Campylobacter*

The number of *Campylobacter* isolates recovered by species from chicken rinsates is shown in Table 1B. *Campylobacter jejuni* were more frequently recovered than *C. coli*. The distribution of *Campylobacter* species recovered from chicken has remained relatively stable since 1998 (Figure 1B).

MIC distributions by antimicrobial and species are shown in Table 2B. No resistance to florfenicol was observed for either species. In 2007, resistance was higher for *C. coli* than *C. jejuni* for all drugs with the exception of the quinolones and tetracycline. *Campylobacter jejuni* exhibited more resistance to ciprofloxacin, nalidixic acid and tetracycline.

Percent resistance by year, antimicrobial, and species are shown in Table 3B. In 2007, an increase in resistance was observed in *C. coli* to the lincosamides and macrolides/ketolides and in *C. jejuni* to the quinolones. Tetracycline resistance decreased in *C. coli* and remained stable for *C. jejuni* in 2007. *Campylobacter coli* were more resistant to tetracycline than *C. jejuni* from 1998 to 2004; from 2005 to 2007 *C. jejuni* exhibited more resistance to tetracycline. Testing methods (Etest® from 1998-2004 and broth microdilution from 2005 to present) may have influenced this change.

MDR by CLSI subclass is presented in Tables 4B and 5B. Overall, MDR has been more frequently observed in *C. coli* than *C. jejuni.*

C. *Escherichia coli* (generic)

The number of *E. coli* isolates from chicken rinsates tested is shown in Table 1C. MIC distribution by antimicrobial is shown in Table 2C.

Percent resistance by year is shown in Table 3C. No resistance has been observed to amikacin for any year. Since 2004, resistance to ceftriaxone has remained very low (≤0.1%). A decrease in resistance was observed between 2006 and 2007 for kanamycin, streptomycin, ampicillin, amoxicillin-clavulanic acid, ceftiofur, cefoxitin, trimethoprim/sulfamethoxazole, nalidixic acid, and tetracycline. Resistance to ciprofloxacin remained sporadic and low; only one isolate was resistant in 2007. Resistance to all other drugs (gentamicin, sulfonamides, and chloramphenicol) increased.

MDR by CLSI subclass is presented in Table 4C. Over time, pan-susceptibility has increased.

V. NARMS Animal Arm Contact

Dr. Paula Fedorka-Cray

Research Leader, Bacterial Epidemiology and Antimicrobial Resistance Research Unit

950 College Station Rd.

Athens, GA 30605

Email: Paula.cray@ars.usda.gov

(706) 546-3685

(706) 546-3693 Fax

VI. Results

A. *Salmonella*

Table 1A. *Salmonella* Isolates Tested by Year and Animal Source, 1997-2007

Animal Source	Year										
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994
Turkey	107	240	713	518	550	244	262	236	227	304	271
Cattle	24	284	1610	1388	893	1008	670	607	329	389	439
Swine	111	793	876	451	418	379	211	308	301	304	211

Table 2A. Most Common Serotypes among *Salmonella* Isolates, 2007

Animal Source	Rank	Serotype	n	%
Chicken (n=994)	1	Kentucky	443	44.6
	2	Heidelberg	142	14.3
	3	Enteritidis	124	12.5
	4	Typhimurium var. 5-	50	5.0
	5	4,[5],12:i:-	49	4.9
	6	Typhimurium	33	3.3
	7	Montevideo	20	2.0
	8	Infantis	16	1.6
	9	Berta	13	1.3
	10	Mbandaka	11	1.1
	10	Schwarzengrund	11	1.1
Subtotal			912	91.8
		Others	82	8.2
Total			994	100

Animal Source	Rank	Serotype	n	%
Turkey (n=271)	1	Hadar	118	43.5
	2	Saintpaul	29	10.7
	3	Heidelberg	23	8.5
	4	Newport	15	5.5
	5	Agona	14	5.2
	6	Senftenberg	9	3.3
	7	Reading	8	3.0
	8	Schwarzengrund	5	1.8
	9	Typhimurium	4	1.5
	9	Berta	4	1.5
	9	Muenchen	4	1.5
	10	Montevideo	3	1.1
	10	Mbandaka	3	1.1
	10	Minnesota	3	1.1
	10	Worthington	3	1.1
Subtotal			245	90.4
		Others	26	9.6
Total			271	100

Animal Source	Rank	Serotype	n	%
Cattle (n=439)	1	Montevideo	95	21.6
	2	Dublin	40	9.1
	3	Muenster	33	7.5
	4	Newport	30	6.8
	5	Mbandaka	27	6.2
	6	Cerro	24	5.5
	7	Anatum	23	5.2
	8	Agona	17	3.9
	8	Meleagridis	17	3.9
	9	Typhimurium	14	3.2
	10	Infantis	13	3.0
Subtotal			333	75.9
		Others	106	24.1
Total			439	100

Animal Source	Rank	Serotype	n	%
Swine (n=211)	1	Derby	29	13.7
	2	Typhimurium var. 5-	26	12.3
	3	Johannesburg	22	10.4
	4	Typhimurium	18	8.5
	5	Infantis	17	8.1
	6	Saintpaul	12	5.7
	7	London	10	4.7
	7	Anatum	10	4.7
	7	Adelaide	10	4.7
	8	Hadar	9	4.3
	9	Agona	8	3.8
	10	Muenchen	4	1.9
Subtotal			175	82.9
		Others	36	11.8
Total			211	95

Figure 1A. Chicken- Serotype Percent Distribution by Year in Relation to Top Serotypes Identified in 2007

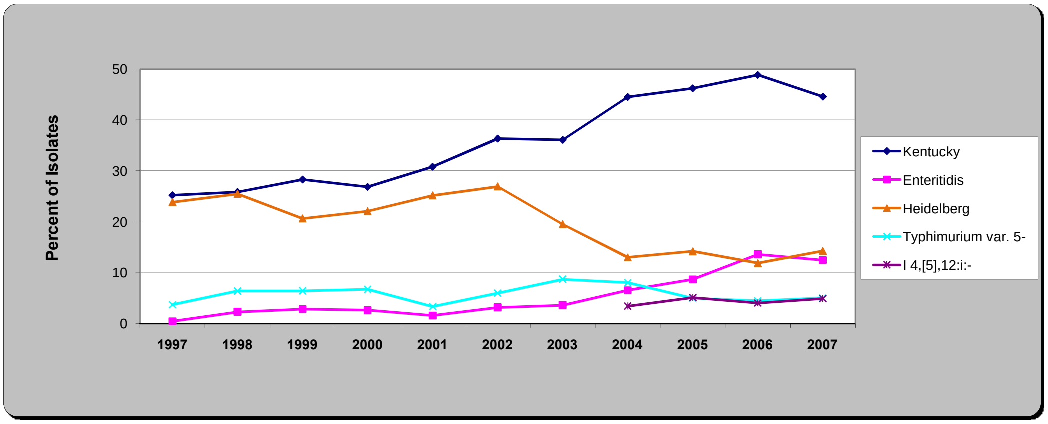

Figure 2A. Turkey- Serotype Percent Distribution by Year in Relation to Top Serotypes Identified in 2007

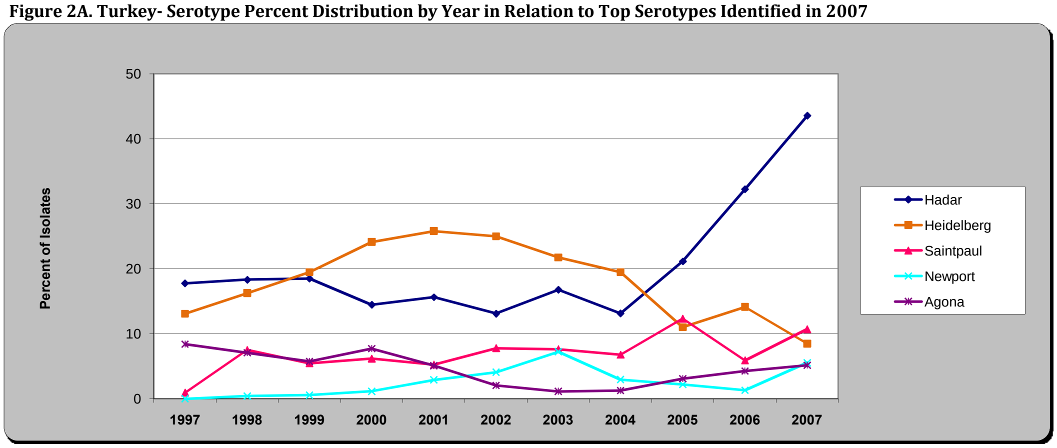

Figure 3A. Cattle- Serotype Percent Distribution by Year in Relation to Top Serotypes Identified in 2007

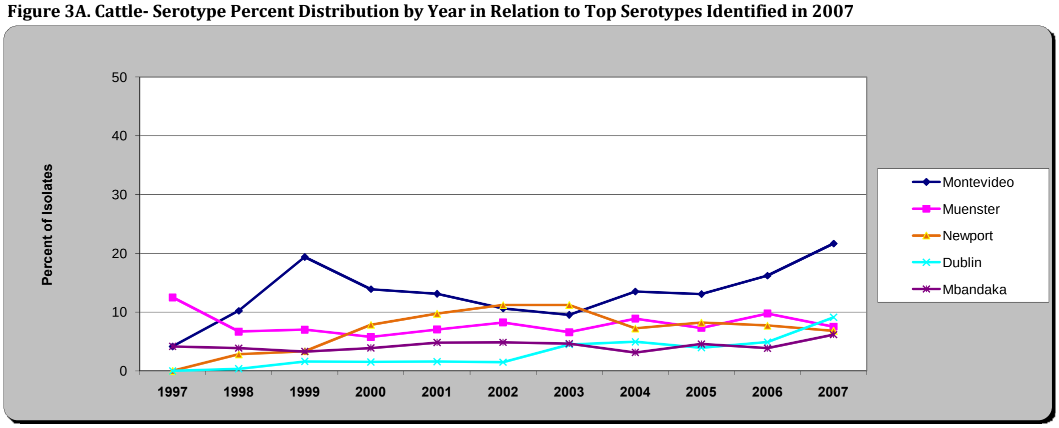

Figure 4A. Swine- Serotype Percent Distribution by Year in Relation to Top Serotypes Identified in 2007

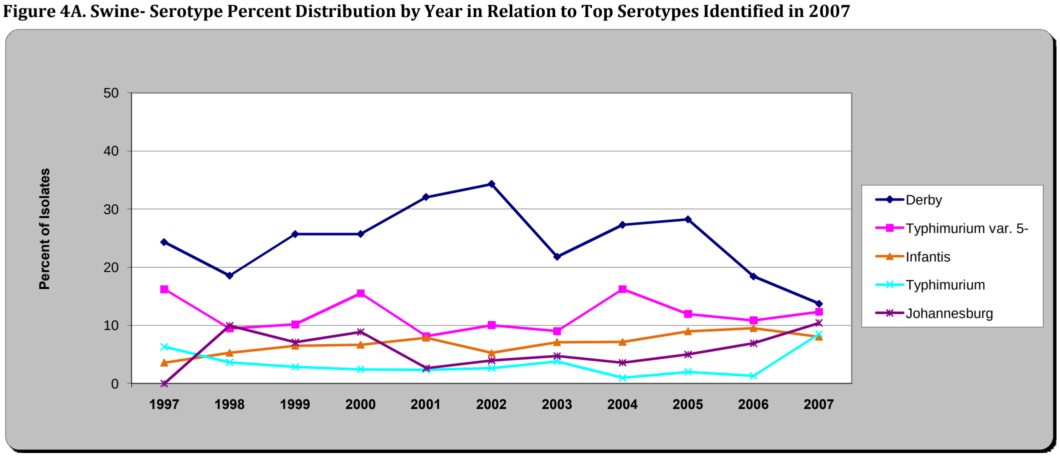

Table 3A. Distribution of MICs and Occurrence of Resistance by Animal Source among *Salmonella* , 2007

	Isolate Source				Distribution (%) of MICs (µg/ml)[4]																
Antimicrobial	**(# of Isolates)**	**%I[1]**	**%R[2]**	**95% CI[3]**	**0.015**	**0.03**	**0.06**	**0.125**	**0.25**	**0.50**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**
Aminoglycosides																					
Amikacin	Chicken (994)	0.0	**0.0**	0.0-0.5						35.5	57.5	6.4	0.5								
	Turkey (271)	0.0	**0.0**	0.0-1.7						18.1	67.9	12.5	1.1	0.4							
	Cattle (439)	0.0	**0.0**	0.0-1.1						12.3	60.8	25.3	1.4	0.2							
	Swine (211)	0.0	**0.5**	0-3.1						13.3	71.6	11.8	2.8					**0.5**			
Gentamicin	Chicken (994)	0.6	**4.5**	3.3-6.0					83.7	10.0	0.8		0.4	0.6	**2.9**	**1.6**					
	Turkey (271)	4.1	**12.9**	9.3-17.6					66.4	14.8	1.1	0.4	0.4	4.1	**7.0**	**5.9**					
	Cattle (439)	0.0	**1.6**	0.7-3.4					63.8	33.3	1.4				**0.7**	**0.9**					
	Swine (211)	0.5	**0.9**	0.1-3.7					77.7	20.9				0.5	**0.5**	**0.5**					
Kanamycin	Chicken (994)	0.0	**3.4**	2.4-4.8										96.1	0.5		**0.2**	**3.2**			
	Turkey (271)	1.1	**16.2**	12.1-21.3										82.3	0.4	1.1	**1.1**	**15.1**			
	Cattle (439)	0.0	**7.7**	5.5-10.7										91.8	0.5		**0.5**	**7.3**			
	Swine (211)	0.0	**7.1**	4.2-11.7										92.9				**7.1**			
Streptomycin	Chicken (994)	N/A	**19.3**	16.9-21.9												80.7	**16.7**	**2.6**			
	Turkey (271)	N/A	**34.7**	29.1-40.7												65.3	**22.1**	**12.5**			
	Cattle (439)	N/A	**19.8**	16.2-23.9												80.2	**2.5**	**17.3**			
	Swine (211)	N/A	**27.0**	21.2-33.6												73.0	**18.0**	**9.0**			
Aminopenicillins																					
Ampicillin	Chicken (994)	0.0	**17.0**	14.7-19.5							80.4	2.3	0.2	0.1		**0.1**	**16.9**				
	Turkey (271)	0.0	**36.9**	31.2-43.0							60.9	2.2					**36.9**				
	Cattle (439)	0.0	**20.0**	16.4-24.1							77.0	2.7	0.2				**20.0**				
	Swine (211)	0.0	**18.0**	13.2-24.0							75.4	5.7	0.5	0.5		**0.5**	**17.5**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Chicken (994)	0.2	**15.6**	13.4-18.0							82.2	0.7	0.2	1.1	0.2	**1.5**	**14.1**				
	Turkey (271)	17.3	**11.1**	7.7-15.6							60.5	2.6	0.4	8.1	17.3	**2.6**	**8.5**				
	Cattle (439)	1.6	**15.5**	12.3-19.3							76.5	2.7	1.4	2.3	1.6	**3.2**	**12.3**				
	Swine (211)	11.4	**3.3**	1.5-7.0							80.6	0.9		3.8	11.4	**0.9**	**2.4**				
Cephalosporins																					
Ceftiofur	Chicken (994)	0.4	**15.4**	13.2-17.8				0.2	4.0	54.5	25.4	0.1	0.4	**2.6**	**12.8**						
	Turkey (271)	0.0	**11.1**	7.7-15.6					0.7	43.9	43.5	0.7		**1.5**	**9.6**						
	Cattle (439)	0.9	**15.5**	12.3-19.3				0.2	1.8	39.6	41.0	0.9	0.9	**2.1**	**13.4**						
	Swine (211)	0.9	**2.8**	1.1-6.3						40.3	55.0	0.9	0.9	**0.5**	**2.4**						
Ceftriaxone	Chicken (994)	10.0	**0.4**	0.1-1.1					84.2	0.2			0.5	4.7	8.0	1.9	**0.4**				
	Turkey (271)	8.1	**0.0**	0.0-1.7					88.6	0.4				3.0	5.5	2.6					
	Cattle (439)	13.4	**0.7**	0.2-2.2					82.9	0.7	0.2	0.2	0.5	1.4	8.9	4.6	**0.7**				
	Swine (211)	1.9	**0.5**	0-3.1					96.7			0.9			1.9		**0.5**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 3A (continued). Distribution of MICs and Occurrence of Resistance by Animal Source among *Salmonella* , 2007

	Isolate Source				Distribution (%) of MICs (µg/ml)[4]																
Antimicrobial	**(# of Isolates)**	**%I[1]**	**%R[2]**	**[95% CI][3]**	**0.015**	**0.03**	**0.06**	**0.125**	**0.25**	**0.50**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**
Cephamycins																					
Cefoxitin	Chicken (994)	2.3	**13.0**	11.0-15.3						0.2	12.3	45.5	22.2	4.5	2.3	**9.8**	**3.2**				
	Turkey (271)	3.0	**9.2**	6.2-13.4							7.0	49.8	25.1	5.9	3.0	**4.4**	**4.8**				
	Cattle (439)	1.4	**15.0**	11.9-18.8						0.2	6.6	34.2	33.3	9.3	1.4	**3.9**	**11.2**				
	Swine (211)	0.0	**2.8**	1.1-6.3							2.8	40.3	44.1	10.0		**1.9**	**0.9**				
Folate Pathway Inhibitors																					
Sulfonamides	Chicken (994)	N/A	**10.4**	8.6-12.5											38.8	45.7	4.9	0.1	0.1	**10.4**	
	Turkey (271)	N/A	**25.5**	20.5-31.2											17.0	46.9	9.6	0.7	0.4	**25.5**	
	Cattle (439)	N/A	**21.6**	17.9-25.8											25.1	42.6	10.5	0.2		**21.6**	
	Swine (211)	N/A	**30.8**	24.7-37.6											35.1	27.0	6.6		0.5	**30.8**	
Trimethoprim-Sulfamethoxazole	Chicken (994)	N/A	**0.0**	0.0-0.5				88.0	10.0	1.8	0.2										
	Turkey (271)	N/A	**1.1**	0.3-3.5				77.9	17.7	1.1	1.1	1.1		**1.1**							
	Cattle (439)	N/A	**3.0**	1.7-5.2				73.1	18.7	4.1	0.9	0.2	**0.7**	**2.3**							
	Swine (211)	N/A	**1.9**	0.6-5.1				69.7	23.2	3.3	1.9			**1.9**							
Phenicols																					
Chloramphenicol	Chicken (994)	0.4	**1.8**	1.1-2.9								5.1	58.0	34.6	0.4	**0.1**	**1.7**				
	Turkey (271)	1.8	**5.5**	3.2-9.1								1.1	49.4	42.1	1.8		**5.5**				
	Cattle (439)	0.9	**20.0**	16.4-24.1								0.7	28.7	49.7	0.9		**20.0**				
	Swine (211)	2.4	**15.2**	10.8-20.9								1.4	20.4	60.7	2.4		**15.2**				
Quinolones																					
Ciprofloxacin	Chicken (994)	0.0	**0.0**	0.0-0.5	79.6	18.3	2.0	0.1													
	Turkey (271)	0.0	**0.0**	0.0-1.7	74.5	21.8	2.6		0.7	0.4											
	Cattle (439)	0.0	**0.0**	0.0-1.1	79.0	18.7	1.6	0.2		0.5											
	Swine (211)	0.0	**0.0**	0.0-2.2	81.5	17.5	0.9														
Nalidixic Acid	Chicken (994)	N/A	**0.1**	0-0.6							1.4	43.7	42.9	11.7	0.3		**0.1**				
	Turkey (271)	N/A	**1.1**	0.3-3.5								38.7	39.5	20.3	0.4		**1.1**				
	Cattle (439)	N/A	**0.7**	0.2-2.2							0.5	43.1	44.0	11.8		**0.2**	**0.5**				
	Swine (211)	N/A	**0.0**	0.0-2.2							0.9	37.4	49.3	11.8	0.5						
Tetracyclines																					
Tetracycline	Chicken (994)	1.4	**35.5**	32.5-38.6									63.1	1.4	**0.6**	**1.7**	**33.2**				
	Turkey (271)	0.4	**73.8**	68.1-78.8									25.8	0.4	**0.4**	**13.3**	**60.1**				
	Cattle (439)	0.7	**27.3**	23.2-31.8									72.0	0.7	**1.1**	**3.6**	**22.6**				
	Swine (211)	0.5	**54.5**	47.5-61.3									45.0	0.5	**1.9**	**12.3**	**40.3**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 4A. Antimicrobial Resistance among *Salmonella* by Animal Source, 1997-2007

Year			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested		Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994
		Turkey	107	240	713	518	550	244	262	236	227	304	271
		Cattle	24	284	1610	1388	893	1008	670	607	329	389	439
		Swine	111	793	876	451	418	379	211	308	301	304	211
Antimicrobial Class	**Antimicrobial**	**Isolate Source**											
Aminoglycosides	Amikacin	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	0	0	0
		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	0	0	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
			0	0	0	0	0	0	0	0	0	0	1
	Gentamicin	Chicken	17.8%	15.3%	10.4%	14.9%	7.9%	5.5%	6.3%	4.9%	4.3%	5.7%	4.5%
			38	86	150	175	103	83	73	63	85	79	45
		Turkey	20.6%	18.3%	17.5%	16.2%	20.9%	19.3%	21.0%	25.4%	22.9%	16.4%	12.9%
			22	44	125	84	115	47	55	60	52	50	35
		Cattle	0.0%	1.8%	1.6%	2.1%	2.1%	2.6%	2.7%	1.8%	2.4%	3.9%	1.6%
			0	5	25	29	19	26	18	11	8	15	7
		Swine	0.9%	0.8%	1.1%	1.3%	1.4%	0.8%	0.5%	1.3%	2.7%	2.0%	0.9%
			1	6	10	6	6	3	1	4	8	6	2
	Kanamycin	Chicken	2.3%	3.2%	1.2%	4.1%	2.4%	2.0%	2.8%	2.7%	2.5%	3.6%	3.4%
			5	18	17	48	31	30	32	34	49	49	34
		Turkey	24.3%	17.1%	21.5%	21.4%	22.9%	24.2%	16.0%	14.4%	19.8%	10.5%	16.2%
			26	41	153	111	126	59	42	34	45	32	44
		Cattle	8.3%	9.5%	7.1%	6.6%	6.9%	10.1%	13.7%	8.9%	13.1%	9.5%	7.7%
			2	27	115	92	62	102	92	54	43	37	34
		Swine	11.7%	7.2%	6.7%	9.3%	6.9%	4.2%	5.7%	3.9%	5.0%	8.6%	7.1%
			13	57	59	42	29	16	12	12	15	26	15
	Streptomycin	Chicken	24.3%	27.8%	27.5%	28.6%	21.0%	22.9%	19.6%	22.2%	23.3%	21.2%	19.3%
			52	156	396	335	275	343	227	284	464	293	192
		Turkey	34.6%	40.8%	43.6%	41.9%	46.7%	37.7%	29.4%	33.9%	40.1%	28.9%	34.7%
			37	98	311	217	257	92	77	80	91	88	94
		Cattle	12.5%	16.2%	15.4%	21.3%	20.3%	25.9%	28.7%	20.9%	24.3%	23.7%	19.8%
			3	46	248	296	181	261	192	127	80	92	87
		Swine	27.9%	29.4%	29.3%	39.2%	35.6%	40.1%	30.8%	36.4%	36.5%	26.3%	27.0%
			31	233	257	177	149	152	65	112	110	80	57
Aminopenicillins	Ampicillin	Chicken	11.7%	12.8%	12.4%	13.0%	9.4%	14.3%	13.7%	14.5%	14.0%	14.9%	17.0%
			25	72	179	152	123	215	159	185	279	205	169
		Turkey	12.1%	10.4%	17.7%	16.2%	19.5%	18.0%	18.7%	22.0%	22.9%	25.3%	36.9%
			13	25	126	84	107	44	49	52	52	77	100
		Cattle	12.5%	9.2%	12.5%	18.7%	17.9%	23.9%	28.1%	19.3%	26.7%	22.4%	20.0%
			3	26	202	259	160	241	188	117	88	87	88
		Swine	16.2%	12.9%	10.8%	18.8%	11.7%	13.7%	12.8%	16.2%	13.6%	11.5%	18.0%
			18	102	95	85	49	52	27	50	41	35	38

Table 4A (continued). Resistance among *Salmonella* by Animal Source, 1997-2007

Year			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested		Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994
		Turkey	107	240	713	518	550	244	262	236	227	304	271
		Cattle	24	284	1610	1388	893	1008	670	607	329	389	439
		Swine	111	793	876	451	418	379	211	308	301	304	211
Antimicrobial Class	**Antimicrobial**	**Isolate Source**											
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	Chicken	0.5%	2.0%	4.9%	7.3%	4.5%	10.2%	9.7%	12.4%	12.1%	12.9%	15.6%
			1	11	70	86	59	153	112	159	241	178	155
		Turkey	4.7%	0.4%	4.3%	3.5%	6.9%	3.7%	1.5%	4.7%	3.5%	5.6%	11.1%
			5	1	31	18	38	9	4	11	8	17	30
		Cattle	8.3%	2.5%	3.9%	9.9%	11.8%	17.7%	21.0%	13.5%	21.0%	18.5%	15.5%
			2	7	62	138	105	178	141	82	69	72	68
		Swine	0.0%	0.4%	1.0%	1.8%	2.6%	3.7%	3.8%	1.9%	4.3%	2.3%	3.3%
			0	3	9	8	11	14	8	6	13	7	7
Cephalosporins	Ceftiofur	Chicken	0.5%	2.0%	5.2%	7.6%	4.1%	10.2%	9.8%	12.4%	12.2%	12.8%	15.4%
			1	11	75	89	54	153	113	159	242	177	153
		Turkey	3.7%	0.4%	4.6%	3.3%	5.1%	3.3%	1.5%	4.7%	3.5%	5.3%	11.1%
			4	1	33	17	28	8	4	11	8	16	30
		Cattle	0.0%	2.1%	4.2%	9.8%	11.4%	17.4%	21.0%	13.3%	21.6%	18.8%	15.5%
			0	6	67	136	102	175	141	81	71	73	68
		Swine	0.0%	0.1%	1.9%	1.3%	2.2%	3.2%	4.3%	1.9%	3.7%	2.0%	2.8%
			0	1	17	6	9	12	9	6	11	6	6
	Ceftriaxone	Chicken	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.1%	0.5%	0.3%	0.1%	0.4%
			0	0	0	1	0	5	1	6	5	2	4
		Turkey	0	0.0%	0.8%	0.4%	0.2%	0.0%	0.4%	0.4%	0.9%	0.0%	0.0%
			0	0	6	2	1	0	1	1	2	0	0
		Cattle	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.1%	1.3%	2.1%	1.0%	0.7%
			0	0	1	1	1	2	1	8	7	4	3
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
			0	0	0	0	0	0	0	0	0	0	1
	Cephalothin	Chicken	1.4%	4.5%	5.8%	7.8%	4.7%	10.5%	10.4%	10.4%			
			3	25	83	91	62	158	121	121			
		Turkey	5.6%	5.0%	10.5%	8.3%	13.1%	9.8%	11.1%	11.1%			
			6	12	75	43	72	24	29	29			
		Cattle	0.0%	2.1%	4.7%	9.9%	11.6%	17.7%	21.2%	21.2%			
			0	6	76	137	104	178	142	142			
		Swine	0.0%	0.1%	0.8%	2.4%	2.2%	3.2%	3.8%	3.8%			
			0	1	7	11	9	12	8	8			
Cephamycins	Cefoxitin	Chicken				7.2%	4.1%	8.7%	8.2%	12.4%	12.0%	12.8%	13.0%
						85	53	130	95	159	238	176	129
		Turkey				3.3%	4.5%	2.5%	1.1%	5.1%	3.5%	5.3%	9.2%
						17	25	6	3	12	8	16	25
		Cattle				9.1%	11.1%	15.9%	17.8%	13.2%	19.8%	17.7%	15.0%
						126	99	160	119	80	65	69	66
		Swine				1.3%	2.2%	2.9%	4.3%	1.9%	3.7%	2.0%	2.8%
						6	9	11	9	6	11	6	6

Table 4A (continued). Resistance among *Salmonella* by Animal Source, 1997-2007

Year			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested		Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994
		Turkey	107	240	713	518	550	244	262	236	227	304	271
		Cattle	24	284	1610	1388	893	1008	670	607	329	389	439
		Swine	111	793	876	451	418	379	211	308	301	304	211
Antimicrobial Class	**Antimicrobial**	**Isolate Source**											
Folate Pathway Inhibitors	Sulfonamides	Chicken	24.8% 53	23.7% 133	15.9% 229	18.4% 216	11.8% 154	8.9% 133	10.3% 119	11.9% 152	8.5% 169	10.7% 148	10.4% 103
		Turkey	37.4% 40	32.1% 77	36.0% 257	25.1% 130	38.0% 209	30.3% 74	28.2% 74	36.4% 86	37.0% 84	27.3% 83	25.5% 69
		Cattle	20.8% 5	15.5% 44	15.0% 242	19.9% 276	19.7% 176	22.3% 225	25.1% 168	22.7% 138	27.4% 90	24.2% 94	21.6% 95
		Swine	34.2% 38	29.0% 230	30.7% 269	35.7% 161	34.9% 146	34.6% 131	25.1% 53	37.0% 114	32.9% 99	26.6% 81	30.8% 65
	Trimethoprim-Sulfamethoxazole	Chicken	0.5% 1	1.2% 7	1.1% 16	0.4% 5	0.5% 6	0.8% 12	0.3% 4	0.2% 3	0.2% 4	0.1% 1	0.0% 0
		Turkey	3.7% 4	2.5% 6	4.2% 30	1.5% 8	2.5% 14	2.5% 6	2.3% 6	0.8% 2	1.8% 4	1.0% 3	1.1% 3
		Cattle	4.2% 1	2.5% 7	2.4% 39	2.2% 30	2.6% 23	2.5% 25	3.3% 22	1.5% 9	4.9% 16	4.6% 18	3.0% 13
		Swine	1.8% 2	0.3% 2	1.1% 10	0.9% 4	0.0% 0	1.6% 6	2.4% 5	1.6% 5	2.3% 7	2.0% 6	1.9% 4
Phenicols	Chloramphenicol	Chicken	2.3% 5	2.9% 16	1.8% 26	4.6% 54	2.5% 33	2.4% 36	2.1% 24	1.3% 16	1.8% 36	1.7% 24	1.8% 18
		Turkey	3.7% 4	0.8% 2	4.1% 29	4.1% 21	3.8% 21	5.3% 13	4.2% 11	4.7% 11	4.8% 11	3.9% 12	5.5% 15
		Cattle	4.2% 1	5.6% 16	8.5% 137	15.1% 209	16.5% 147	20.6% 208	25.1% 168	17.6% 107	21.9% 72	19.8% 77	20.0% 88
		Swine	11.7% 13	8.4% 67	8.0% 70	12.4% 56	7.7% 32	10.0% 38	8.5% 18	12.7% 39	10.6% 32	7.9% 24	15.2% 32
Quinolones	Ciprofloxacin	Chicken	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		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	0.0% 0
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Nalidixic Acid	Chicken	0.0% 0	0.2% 1	0.2% 3	0.5% 6	0.0% 0	0.8% 12	0.4% 5	0.5% 6	0.3% 6	0.1% 2	0.1% 1
		Turkey	4.7% 5	2.1% 5	5.3% 38	5.4% 28	5.1% 28	5.3% 13	3.8% 10	2.1% 5	2.2% 5	0.7% 2	1.1% 3
		Cattle	0.0% 0	0.4% 1	0.1% 1	0.4% 6	0.4% 4	0.4% 4	0.4% 3	2.0% 12	1.5% 5	0.5% 2	0.7% 3
		Swine	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0
Tetracyclines	Tetracycline	Chicken	20.6% 44	20.5% 115	25.0% 359	26.3% 308	21.9% 286	24.9% 374	26.2% 303	27.4% 351	28.3% 563	31.8% 439	35.5% 353
		Turkey	52.3% 56	45.8% 110	52.9% 377	56.2% 291	54.9% 302	54.5% 133	58.8% 154	48.3% 114	54.6% 124	61.8% 188	73.8% 200
		Cattle	25.0% 6	24.3% 69	20.9% 336	25.8% 358	26.3% 235	32.0% 323	36.9% 247	31.8% 193	34.0% 112	30.3% 118	27.3% 120
		Swine	52.3% 58	47.5% 377	48.4% 424	54.3% 245	53.1% 222	57.8% 219	43.1% 91	58.8% 181	54.8% 165	62.8% 191	54.5% 115

Table 5A. Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Chicken, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
					Distribution (%) of MICs (µg/ml)[4]																
Aminoglycosides																					
Amikacin	Kentucky (443)	0.0	**0.0**	0.0-1.1						36.1	58.0	5.9									
	Heidelberg (142)	0.0	**0.0**	0.0-3.3						43.0	47.9	8.5	0.7								
	Enteritidis (124)	0.0	**0.0**	0.0-3.7						39.5	55.6	4.8									
	Typhimurium var. 5- (50)	0.0	**0.0**	0.0-8.9						62.0	36.0	2.0									
	4,[5],12:i:- (49)	0.0	**0.0**	0.0-9.1						16.3	73.5	10.2									
	Typhimurium (33)	0.0	**0.0**	0.0-13.0						42.4	48.5	9.1									
	Montevideo (20)	0.0	**0.0**	0.0-20.0							90.0	10.0									
	Infantis (16)	0.0	**0.0**	0.0-24.1						43.8	50.0	6.2									
	Berta (13)	0.0	**0.0**	0.0-28.3						30.8	61.5	7.7									
	Mbandaka (11)	0.0	**0.0**	0.0-32.1							100.0										
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1						18.2	81.8										
Gentamicin	Kentucky (443)	0.2	**3.4**	2.0-5.7					85.8	9.3	0.9		0.5	0.2	**2.5**	**0.9**					
	Heidelberg (142)	2.8	**11.3**	6.8-18.0					73.9	12.0				2.8	**7.7**	**3.5**					
	Enteritidis (124)	0.0	**0.0**	0.0-3.7					95.2	4.0			0.8								
	Typhimurium var. 5- (50)	0.0	**2.0**	0.1-12.0					92.0	6.0					**2.0**						
	4,[5],12:i:- (49)	0.0	**0.0**	0.0-9.1					87.8	12.2											
	Typhimurium (33)	0.0	**6.1**	1.1-21.7					87.9	6.1					**6.1**						
	Montevideo (20)	0.0	**20.0**	6.6-44.3					50.0	30.0					**5.0**	**15.0**					
	Infantis (16)	0.0	**0.0**	0.0-24.1					87.5	6.2	6.2										
	Berta (13)	0.0	**0.0**	0.0-28.3					92.3				7.7								
	Mbandaka (11)	0.0	**9.1**	0.5-42.9					63.6	27.3						**9.1**					
	Schwarzengrund (11)	0.0	**9.1**	0.5-42.9					63.6	18.2	9.1					**9.1**					
Kanamycin	Kentucky (443)	0.0	**2.0**	1.0-3.9										97.7	0.2			**2.0**			
	Heidelberg (142)	0.0	**6.3**	3.1-12.0										93.0	0.7		**1.4**	**4.9**			
	Enteritidis (124)	0.0	**0.0**	0.0-3.7										99.2	0.8						
	Typhimurium var. 5- (50)	0.0	**10.0**	3.7-22.6										90.0				**10.0**			
	4,[5],12:i:- (49)	0.0	**4.1**	0.7-15.2										95.9				**4.1**			
	Typhimurium (33)	0.0	**3.0**	0.2-17.5										93.9	3.0			**3.0**			
	Montevideo (20)	0.0	**10.0**	1.8-33.1										85.0	5.0			**10.0**			
	Infantis (16)	0.0	**0.0**	0.0-24.1										100.0							
	Berta (13)	0.0	**0.0**	0.0-28.3										100.0							
	Mbandaka (11)	0.0	**9.1**	0.5-42.9										90.9				**9.1**			
	Schwarzengrund (11)	0.0	**9.1**	0.5-42.9										90.9				**9.1**			
Streptomycin	Kentucky (443)	N/A	**32.5**	28.2-37.1												67.5	**29.8**	**2.7**			
	Heidelberg (142)	N/A	**13.4**	8.5-20.4												86.6	**7.0**	**6.3**			
	Enteritidis (124)	N/A	**0.8**	0.0-5.1												99.2	**0.8**				
	Typhimurium var. 5- (50)	N/A	**10.0**	3.7-22.6												90.0	**8.0**	**2.0**			
	4,[5],12:i:- (49)	N/A	**8.2**	2.7-20.5												91.8	**6.1**	**2.0**			
	Typhimurium (33)	N/A	**12.1**	3.9-29.1												87.9	**12.1**				
	Montevideo (20)	N/A	**10.0**	1.8-33.1												90.0	**5.0**	**5.0**			
	Infantis (16)	N/A	**0.0**	0.0-24.1												100.0					
	Berta (13)	N/A	**0.0**	0.0-28.3												100.0					
	Mbandaka (11)	N/A	**9.1**	0.5-42.9												90.9	**9.1**				
	Schwarzengrund (11)	N/A	**9.1**	0.5-42.9												90.9	**9.1**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 5A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Chicken, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Kentucky (443)	0.0	**20.1**	16.5-24.2							77.9	1.6	0.2	0.2		**0.2**	**19.9**				
	Heidelberg (142)	0.0	**20.4**	14.3-28.1							78.2	1.4					**19.7**	**0.7**			
	Enteritidis (124)	0.0	**1.6**	0.3-6.3							93.5	4.0	0.8				**1.6**				
	Typhimurium var. 5- (50)	0.0	**50.0**	35.7-64.3							50.0						**50.0**				
	4,[5],12:i:- (49)	0.0	**20.4**	10.7-34.8							77.6	2.0					**20.4**				
	Typhimurium (33)	0.0	**18.2**	7.6-36.1							72.7	9.1					**18.2**				
	Montevideo (20)	0.0	**0.0**	0.0-20.0							95.0	5.0									
	Infantis (16)	0.0	**0.0**	0.0-24.1							100.0										
	Berta (13)	0.0	**7.7**	0.4-37.9							84.6	7.7					**7.7**				
	Mbandaka (11)	0.0	**0.0**	0.0-32.1							100.0										
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1							81.8	18.2									
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Kentucky (443)	0.0	**19.9**	16.3-24.0							79.0	0.7	0.2	0.2		**1.8**	**18.1**				
	Heidelberg (142)	0.0	**17.6**	11.9-25.1							78.9	0.7		2.8		**2.8**	**14.8**				
	Enteritidis (124)	0.0	**0.0**	0.0-3.7							97.6	0.8		1.6							
	Typhimurium var. 5- (50)	2.0	**46.0**	32.1-60.5							50.0			2.0	2.0	**4.0**	**42.0**				
	4,[5],12:i:- (49)	2.0	**16.3**	7.8-30.2							75.5	4.1	2.0		2.0		**16.3**				
	Typhimurium (33)	0.0	**15.2**	5.7-32.7							81.8			3.0			**15.2**				
	Montevideo (20)	0.0	**0.0**	0.0-20.0							100.0										
	Infantis (16)	0.0	**0.0**	0.0-24.1							100.0										
	Berta (13)	0.0	**0.0**	0.0-28.3							92.3			7.7							
	Mbandaka (11)	0.0	**0.0**	0.0-32.1							100.0										
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1							100.0										
Cephalosporins																					
Ceftiofur	Kentucky (443)	0.2	**19.9**	16.3-24.0				0.2	8.4	63.4	7.7	0.2	0.2	**2.3**	**17.6**						
	Heidelberg (142)	0.0	**16.9**	11.3-24.3						66.9	16.2			**1.4**	**15.5**						
	Enteritidis (124)	1.6	**0.0**	0.0-3.7					0.8	12.1	85.5		1.6								
	Typhimurium var. 5- (50)	2.0	**44.0**	30.3-58.7						42.0	12.0		2.0	**20.0**	**24.0**						
	4,[5],12:i:- (49)	0.0	**16.3**	7.8-30.2						71.4	12.2			**6.1**	**10.2**						
	Typhimurium (33)	0.0	**15.2**	5.7-32.7				3.0		42.4	39.4				**15.2**						
	Montevideo (20)	0.0	**0.0**	0.0-20.0						70.0	30.0										
	Infantis (16)	0.0	**0.0**	0.0-24.1						6.2	93.8										
	Berta (13)	0.0	**0.0**	0.0-28.3						84.6	15.4										
	Mbandaka (11)	0.0	**0.0**	0.0-32.1						9.1	90.9										
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1						72.7	27.3										
Ceftriaxone	Kentucky (443)	13.3	**0.2**	0.0-1.4					79.7	0.5			0.5	5.9	11.3	2.0	**0.2**				
	Heidelberg (142)	12.0	**1.4**	0.2-5.5					82.4				0.7	3.5	8.5	3.5	**1.4**				
	Enteritidis (124)	0.0	**0.0**	0.0-3.7					100.0												
	Typhimurium var. 5- (50)	20.0	**0.0**	0.0-8.9					54.0				4.0	22.0	16.0	4.0					
	4,[5],12:i:- (49)	10.2	**0.0**	0.0-9.1					83.7					6.1	8.2	2.0					
	Typhimurium (33)	12.1	**0.0**	0.0-13.0					84.8					3.0	12.1						
	Montevideo (20)	0.0	**0.0**	0.0-20.0					100.0												
	Infantis (16)	0.0	**0.0**	0.0-24.1					100.0												
	Berta (13)	0.0	**0.0**	0.0-28.3					100.0												
	Mbandaka (11)	0.0	**0.0**	0.0-32.1					100.0												
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1					100.0												

1 Percent of isolates with intermediate susceptibility

2 Percent of isolates that were resistant

3 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 5A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Chicken, 2007

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
Cephamycins																					
Cefoxitin	Kentucky (443)	3.6	**16.3**	13.1-20.1						0.5	16.9	46.7	14.7	1.4	3.6	**13.5**	**2.7**				
	Heidelberg (142)	0.0	**16.9**	11.3-24.3							19.7	39.4	18.3	5.6		**7.7**	**9.2**				
	Enteritidis (124)	0.0	**0.0**	0.0-3.7							1.6	65.3	24.2	8.9							
	Typhimurium var. 5- (50)	12.0	**30.0**	18.3-44.8							2.0	22.0	28.0	6.0	12.0	**26.0**	**4.0**				
	4,[5],12:i:- (49)	0.0	**16.3**	7.8-30.2							8.2	46.9	22.4	6.1		**14.3**	**2.0**				
	Typhimurium (33)	0.0	**15.2**	5.7-32.7							9.1	42.4	21.2	12.1		**15.2**					
	Montevideo (20)	0.0	**0.0**	0.0-20.0								75.0	20.0	5.0							
	Infantis (16)	0.0	**0.0**	0.0-24.1									87.5	12.5							
	Berta (13)	0.0	**0.0**	0.0-28.3							15.4	61.5	23.1								
	Mbandaka (11)	0.0	**0.0**	0.0-32.1									100.0								
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1								54.5	45.5								
Folate Pathway Inhibitors																					
Sulfonamides	Kentucky (443)	N/A	**3.8**	2.3-6.2											43.6	48.5	4.1			**3.8**	
	Heidelberg (142)	N/A	**13.4**	8.5-20.4											69.7	16.9				**13.4**	
	Enteritidis (124)	N/A	**0.8**	0.0-5.1											21.8	64.5	12.9			**0.8**	
	Typhimurium var. 5- (50)	N/A	**70.0**	55.2-81.7											20.0	10.0				**70.0**	
	4,[5],12:i:- (49)	N/A	**6.1**	1.6-17.8											18.4	69.4	6.1			**6.1**	
	Typhimurium (33)	N/A	**45.5**	28.6-63.4											15.2	36.4	3.0			**45.5**	
	Montevideo (20)	N/A	**10.0**	1.8-33.1											45.0	45.0				**10.0**	
	Infantis (16)	N/A	**0.0**	0.0-24.1											18.8	56.2	25.0				
	Berta (13)	N/A	**7.7**	0.4-37.9											46.2	46.2				**7.7**	
	Mbandaka (11)	N/A	**9.1**	0.5-42.9												72.7	18.2			**9.1**	
	Schwarzengrund (11)	N/A	**9.1**	0.5-42.9											27.3	54.5	9.1			**9.1**	
Trimethoprim-Sulfamethoxazole	Kentucky (443)	N/A	**0.0**	0.0-1.1				90.7	8.6	0.7											
	Heidelberg (142)	N/A	**0.0**	0.0-3.3				87.3	10.6	2.1											
	Enteritidis (124)	N/A	**0.0**	0.0-3.7				91.1	8.9												
	Typhimurium var. 5- (50)	N/A	**0.0**	0.0-8.9				64.0	18.0	16.0	2.0										
	4,[5],12:i:- (49)	N/A	**0.0**	0.0-9.1				87.8	12.2												
	Typhimurium (33)	N/A	**0.0**	0.0-13.0				75.8	9.1	12.1	3.0										
	Montevideo (20)	N/A	**0.0**	0.0-20.0				90.0	10.0												
	Infantis (16)	N/A	**0.0**	0.0-24.1				93.8	6.2												
	Berta (13)	N/A	**0.0**	0.0-28.3				92.3	7.7												
	Mbandaka (11)	N/A	**0.0**	0.0-32.1				81.8	18.2												
	Schwarzengrund (11)	N/A	**0.0**	0.0-32.1				90.9	9.1												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 5A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Chicken, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Phenicols																					
Chloramphenicol	Kentucky (443)	0.2	**2.0**	1.0-3.9								9.7	82.6	5.4	0.2	**0.2**	**1.8**				
	Heidelberg (142)	0.7	**4.2**	1.7-9.3									22.5	72.5	0.7		**4.2**				
	Enteritidis (124)	0.0	**0.0**	0.0-3.7								0.8	50.8	48.4							
	Typhimurium var. 5- (50)	2.0	**2.0**	0.1-12.0								4.0	54.0	38.0	2.0		**2.0**				
	4,[5],12:i:- (49)	0.0	**0.0**	0.0-9.1									49.0	51.0							
	Typhimurium (33)	0.0	**0.0**	0.0-13.0								6.1	42.4	51.5							
	Montevideo (20)	0.0	**0.0**	0.0-20.0									35.0	65.0							
	Infantis (16)	6.2	**0.0**	0.0-24.1										93.8	6.2						
	Berta (13)	0.0	**0.0**	0.0-28.3									69.2	30.8							
	Mbandaka (11)	0.0	**0.0**	0.0-32.1										100.0							
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1									72.7	27.3							
Quinolones																					
Ciprofloxacin	Kentucky (443)	0.0	**0.0**	0.0-1.1	88.9	10.6	0.2	0.2													
	Heidelberg (142)	0.0	**0.0**	0.0-3.3	75.4	18.3	6.3														
	Enteritidis (124)	0.0	**0.0**	0.0-3.7	55.6	41.1	3.2														
	Typhimurium var. 5- (50)	0.0	**0.0**	0.0-8.9	64.0	32.0	4.0														
	4,[5],12:i:- (49)	0.0	**0.0**	0.0-9.1	73.5	26.5															
	Typhimurium (33)	0.0	**0.0**	0.0-13.0	69.7	30.3															
	Montevideo (20)	0.0	**0.0**	0.0-20.0	90.0	10.0															
	Infantis (16)	0.0	**0.0**	0.0-24.1	87.5	6.2	6.2														
	Berta (13)	0.0	**0.0**	0.0-28.3	84.6	15.4															
	Mbandaka (11)	0.0	**0.0**	0.0-32.1	81.8	18.2															
	Schwarzengrund (11)	0.0	**0.0**	0.0-32.1	81.8	18.2															
Nalidixic Acid	Kentucky (443)	N/A	**0.2**	0.0-1.4							2.7	66.1	29.3	1.6			**0.2**				
	Heidelberg (142)	N/A	**0.0**	0.0-3.3								12.0	66.2	21.8							
	Enteritidis (124)	N/A	**0.0**	0.0-3.7								8.1	75.8	16.1							
	Typhimurium var. 5- (50)	N/A	**0.0**	0.0-8.9							2.0	22.0	40.0	34.0	2.0						
	4,[5],12:i:- (49)	N/A	**0.0**	0.0-9.1								46.9	28.6	22.4	2.0						
	Typhimurium (33)	N/A	**0.0**	0.0-13.0								36.4	33.3	27.3	3.0						
	Montevideo (20)	N/A	**0.0**	0.0-20.0								25.0	70.0	5.0							
	Infantis (16)	N/A	**0.0**	0.0-24.1								50.0	37.5	12.5							
	Berta (13)	N/A	**0.0**	0.0-28.3								61.5	30.8	7.7							
	Mbandaka (11)	N/A	**0.0**	0.0-32.1								63.6	27.3	9.1							
	Schwarzengrund (11)	N/A	**0.0**	0.0-32.1								36.4	36.4	27.3							
Tetracyclines																					
Tetracycline	Kentucky (443)	2.5	**56.9**	52.1-61.5									40.6	2.5	**0.2**	**1.4**	**55.3**				
	Heidelberg (142)	0.7	**12.7**	7.9-19.6									86.6	0.7	**1.4**	**1.4**	**9.9**				
	Enteritidis (124)	0.8	**2.4**	0.6-7.4									96.8	0.8	**0.8**	**0.8**	**0.8**				
	Typhimurium var. 5- (50)	0.0	**68.0**	53.2-80.1									32.0			**8.0**	**60.0**				
	4,[5],12:i:- (49)	0.0	**14.3**	6.4-27.9									85.7		**2.0**	**2.0**	**10.2**				
	Typhimurium (33)	0.0	**48.5**	31.2-66.2									51.5			**3.0**	**45.5**				
	Montevideo (20)	0.0	**10.0**	1.8-33.1									90.0				**10.0**				
	Infantis (16)	0.0	**0.0**	0.0-24.1									100.0								
	Berta (13)	7.7	**0.0**	0.0-28.3									92.3	7.7							
	Mbandaka (11)	0.0	**27.3**	7.3-60.7									72.7				**27.3**				
	Schwarzengrund (11)	0.0	**9.1**	0.5-42.9									90.9				**9.1**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 6A. Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Turkey, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Hadar (118)	0.0	**0.0**	0.0-3.9						9.3	75.4	13.6	0.8	0.8							
	Saintpaul (29)	0.0	**0.0**	0.0-14.6						24.1	62.1	10.3	3.4								
	Heidelberg (23)	0.0	**0.0**	0.0-17.8						39.1	56.5	4.3									
	Newport (15)	0.0	**0.0**	0.0-25.3						40.0	60.0										
	Agona (14)	0.0	**0.0**	0.0-26.8						14.3	78.6	7.1									
	Senftenberg (9)	0.0	**0.0**	0.0-37.1							44.4	55.6									
	Reading (8)	0.0	**0.0**	0.0-40.2						25.0	62.5	12.5									
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7						20.0	60.0	20.0									
Gentamicin	Hadar (118)	1.7	**9.3**	5.0-16.4					66.9	19.5	2.5			1.7	**5.9**	**3.4**					
	Saintpaul (29)	10.3	**20.7**	8.7-40.3					58.6	10.3				10.3	**17.2**	**3.4**					
	Heidelberg (23)	17.4	**13.0**	3.4-34.6					65.2				4.3	17.4	**4.3**	**8.7**					
	Newport (15)	6.7	**0.0**	0.0-25.3					80.0	13.3				6.7							
	Agona (14)	0.0	**7.1**	0.4-35.8					92.9						**7.1**						
	Senftenberg (9)	0.0	**44.4**	15.3-77.3					11.1	44.4					**11.1**	**33.3**					
	Reading (8)	0.0	**0.0**	0.0-40.2					100.0												
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7					100.0												
Kanamycin	Hadar (118)	0.0	**11.0**	6.2-18.4										89.0				**11.0**			
	Saintpaul (29)	6.9	**17.2**	6.5-36.4										75.9		6.9	**10.3**	**6.9**			
	Heidelberg (23)	0.0	**34.8**	17.2-57.2										60.9	4.3			**34.8**			
	Newport (15)	0.0	**6.7**	0.4-34.0										93.3				**6.7**			
	Agona (14)	0.0	**0.0**	0.0-26.8										100.0							
	Senftenberg (9)	0.0	**77.8**	40.2-96.1										22.2				**77.8**			
	Reading (8)	0.0	**12.5**	0.7-53.3										87.5				**12.5**			
	Schwarzengrund (5)	0.0	**20.0**	1.1-70.1										80.0				**20.0**			
Streptomycin	Hadar (118)	N/A	**48.3**	39.1-57.6												51.7	**40.7**	**7.6**			
	Saintpaul (29)	N/A	**6.9**	1.2-24.2												93.1		**6.9**			
	Heidelberg (23)	N/A	**26.1**	11.1-48.7												73.9	**13.0**	**13.0**			
	Newport (15)	N/A	**6.7**	0.4-34.0												93.3	**6.7**				
	Agona (14)	N/A	**50.0**	24.0-76.0												50.0	**7.1**	**42.9**			
	Senftenberg (9)	N/A	**66.7**	30.9-91.0												33.3		**66.7**			
	Reading (8)	N/A	**12.5**	0.7-53.3												87.5		**12.5**			
	Schwarzengrund (5)	N/A	**0.0**	0.0-53.7												100.0					

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 6A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Turkey, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Hadar (118)	0.0	**33.1**	24.9-42.4							65.3	1.7					**33.1**				
	Saintpaul (29)	0.0	**31.0**	15.9-50.9							62.1	6.9					**31.0**				
	Heidelberg (23)	0.0	**65.2**	42.8-82.8							34.8						**65.2**				
	Newport (15)	0.0	**6.7**	0.4-34.0							93.3						**6.7**				
	Agona (14)	0.0	**57.1**	29.6-81.2							42.9						**57.1**				
	Senftenberg (9)	0.0	**77.8**	40.2-96.1							22.2						**77.8**				
	Reading (8)	0.0	**37.5**	10.2-74.1							50.0	12.5					**37.5**				
	Schwarzengrund (5)	0.0	**20.0**	1.1-70.1							80.0						**20.0**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Hadar (118)	24.6	**1.7**	0.3-6.6							64.4	2.5		6.8	24.6		**1.7**				
	Saintpaul (29)	17.2	**13.8**	4.5-32.6							62.1	6.9			17.2	**3.4**	**10.3**				
	Heidelberg (23)	4.3	**26.1**	11.1-48.7							30.4	4.3		34.8	4.3		**26.1**				
	Newport (15)	0.0	**6.7**	0.4-34.0							93.3						**6.7**				
	Agona (14)	7.1	**50.0**	24.0-76.0							42.9				7.1	**7.1**	**42.9**				
	Senftenberg (9)	55.6	**0.0**	0.0-37.1							22.2			22.2	55.6						
	Reading (8)	12.5	**25.0**	4.5-64.4							50.0	12.5			12.5	**25.0**					
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7							80.0			20.0							
Cephalosporins																					
Ceftiofur	Hadar (118)	0.0	**1.7**	0.3-6.6						41.5	56.8				**1.7**						
	Saintpaul (29)	0.0	**13.8**	4.5-32.6						44.8	41.4				**13.8**						
	Heidelberg (23)	0.0	**26.1**	11.1-48.7						56.5	17.4			**8.7**	**17.4**						
	Newport (15)	0.0	**6.7**	0.4-34.0						73.3	20.0				**6.7**						
	Agona (14)	0.0	**50.0**	24.0-76.0						14.3	35.7				**50.0**						
	Senftenberg (9)	0.0	**0.0**	0.0-37.1						22.2	66.7	11.1									
	Reading (8)	0.0	**25.0**	4.5-64.4						12.5	50.0	12.5		**25.0**							
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7						100.0											
Ceftriaxone	Hadar (118)	1.7	**0.0**	0.0-3.9					98.3						0.8	0.8					
	Saintpaul (29)	10.3	**0.0**	0.0-14.6					82.8	3.4				3.4	10.3						
	Heidelberg (23)	17.4	**0.0**	0.0-17.8					73.9					8.7	17.4						
	Newport (15)	6.7	**0.0**	0.0-25.3					93.3							6.7					
	Agona (14)	50.0	**0.0**	0.0-26.8					50.0						42.9	7.1					
	Senftenberg (9)	0.0	**0.0**	0.0-37.1					100.0												
	Reading (8)	12.5	**0.0**	0.0-40.2					75.0					12.5	12.5						
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7					100.0												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 6A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Turkey, 2007

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
Cephamycins																					
Cefoxitin	Hadar (118)	0.0	**1.7**	0.3-6.6							5.9	68.6	20.3	3.4		**0.8**	**0.8**				
	Saintpaul (29)	3.4	**10.3**	2.7-28.4							10.3	48.3	20.7	6.9	3.4	**6.9**	**3.4**				
	Heidelberg (23)	8.7	**17.4**	5.7-39.6							17.4	34.8	17.4	4.3	8.7	**13.0**	**4.3**				
	Newport (15)	0.0	**6.7**	0.4-34.0							13.3	73.3	6.7			**6.7**					
	Agona (14)	0.0	**50.0**	24.0-76.0								7.1	35.7	7.1			**50.0**				
	Senftenberg (9)	0.0	**0.0**	0.0-37.1								11.1	66.7	22.2							
	Reading (8)	37.5	**25.0**	4.5-64.4									25.0	12.5	37.5	**25.0**					
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7							20.0	40.0	40.0								
Folate Pathway Inhibitors																					
Sulfonamides	Hadar (118)	N/A	**11.0**	6.2-18.4											21.2	53.4	14.4			**11.0**	
	Saintpaul (29)	N/A	**31.0**	15.9-50.9											6.9	44.8	13.8	3.4		**31.0**	
	Heidelberg (23)	N/A	**34.8**	17.2-57.2											34.8	21.7	8.7			**34.8**	
	Newport (15)	N/A	**0.0**	0.0-25.3												100.0					
	Agona (14)	N/A	**78.6**	48.8-94.3												21.4				**78.6**	
	Senftenberg (9)	N/A	**55.6**	22.7-84.7											22.2	22.2				**55.6**	
	Reading (8)	N/A	**25.0**	4.5-64.4											12.5	62.5				**25.0**	
	Schwarzengrund (5)	N/A	**0.0**	0.0-53.7											60.0	20.0	20.0				
Trimethoprim-Sulfamethoxazole	Hadar (118)	N/A	**0.0**	0.0-3.9				80.5	16.9	0.8	0.8	0.8									
	Saintpaul (29)	N/A	**3.4**	0.2-19.6				69.0	24.1			3.4		**3.4**							
	Heidelberg (23)	N/A	**4.3**	0.2-23.9				87.0	8.7					**4.3**							
	Newport (15)	N/A	**0.0**	0.0-25.3				93.3	6.7												
	Agona (14)	N/A	**0.0**	0.0-26.8				71.4	28.6												
	Senftenberg (9)	N/A	**11.1**	0.6-49.3				33.3	22.2	22.2		11.1		**11.1**							
	Reading (8)	N/A	**0.0**	0.0-40.2				87.5	12.5												
	Schwarzengrund (5)	N/A	**0.0**	0.0-53.7				100.0													

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 6A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Turkey, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
					Distribution (%) of MICs (µg/ml)[4]																
Phenicols																					
Chloramphenicol	Hadar (118)	0.0	**0.0**	0.0-3.9								0.8	76.3	22.9							
	Saintpaul (29)	6.9	**3.4**	0.2-19.6									27.6	62.1	6.9		**3.4**				
	Heidelberg (23)	0.0	**4.3**	0.2-23.9									13.0	82.6			**4.3**				
	Newport (15)	0.0	**0.0**	0.0-25.3								6.7	60.0	33.3							
	Agona (14)	0.0	**42.9**	18.8-70.4									7.1	50.0			**42.9**				
	Senftenberg (9)	0.0	**0.0**	0.0-37.1									22.2	77.8							
	Reading (8)	25.0	**12.5**	0.7-53.3										62.5	25.0		**12.5**				
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7									100.0								
Quinolones																					
Ciprofloxacin	Hadar (118)	0.0	**0.0**	0.0-3.9	78.0	21.2	0.8														
	Saintpaul (29)	0.0	**0.0**	0.0-14.6	75.9	24.1															
	Heidelberg (23)	0.0	**0.0**	0.0-17.8	73.9	21.7	4.3														
	Newport (15)	0.0	**0.0**	0.0-25.3	80.0	20.0															
	Agona (14)	0.0	**0.0**	0.0-26.8	85.7	14.3															
	Senftenberg (9)	0.0	**0.0**	0.0-37.1	77.8	11.1	11.1														
	Reading (8)	0.0	**0.0**	0.0-40.2	12.5	50.0	37.5														
	Schwarzengrund (5)	0.0	**0.0**	0.0-53.7	60.0	40.0															
Nalidixic Acid	Hadar (118)	N/A	**0.0**	0.0-3.9								34.7	44.1	21.2							
	Saintpaul (29)	N/A	**0.0**	0.0-14.6								62.1	13.8	20.7	3.4						
	Heidelberg (23)	N/A	**0.0**	0.0-17.8								26.1	47.8	26.1							
	Newport (15)	N/A	**0.0**	0.0-25.3								46.7	33.3	20.0							
	Agona (14)	N/A	**0.0**	0.0-26.8								21.4	71.4	7.1							
	Senftenberg (9)	N/A	**0.0**	0.0-37.1								22.2	55.6	22.2							
	Reading (8)	N/A	**0.0**	0.0-40.2								12.5	37.5	50.0							
	Schwarzengrund (5)	N/A	**0.0**	0.0-53.7								40.0	40.0	20.0							
Tetracyclines																					
Tetracycline	Hadar (118)	0.0	**98.3**	93.4-99.7									1.7			**25.4**	**72.9**				
	Saintpaul (29)	0.0	**44.8**	26.9-64.0									55.2				**44.8**				
	Heidelberg (23)	0.0	**65.2**	42.8-82.8									34.8				**65.2**				
	Newport (15)	6.7	**20.0**	5.3-48.6									73.3	6.7			**20.0**				
	Agona (14)	0.0	**85.7**	56.1-97.5									14.3				**85.7**				
	Senftenberg (9)	0.0	**77.8**	40.2-96.1									22.2				**77.8**				
	Reading (8)	0.0	**37.5**	10.2-74.1									62.5			**12.5**	**25.0**				
	Schwarzengrund (5)	0.0	**40.0**	7.3-83.0									60.0				**40.0**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A. Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Montevideo (95)	0.0	**0.0**	0.0-4.8							56.8	40.0	3.2								
	Dublin (40)	0.0	**0.0**	0.0-10.9						15.0	30.0	52.5	2.5								
	Muenster (33)	0.0	**0.0**	0.0-13.0						6.1	78.8	12.1		3.0							
	Newport (30)	0.0	**0.0**	0.0-14.1						33.3	63.3	3.3									
	Mbandaka (27)	0.0	**0.0**	0.0-15.5							40.7	51.9	7.4								
	Cerro (24)	0.0	**0.0**	0.0-17.2						8.3	70.8	20.8									
	Anatum (23)	0.0	**0.0**	0.0-17.8						30.4	65.2	4.3									
	Agona (17)	0.0	**0.0**	0.0-22.9						11.8	70.6	17.6									
	Meleagridis (17)	0.0	**0.0**	0.0-22.9						23.5	52.9	23.5									
	Typhimurium (14)	0.0	**0.0**	0.0-26.8						14.3	78.6	7.1									
	Infantis (13)	0.0	**0.0**	0.0-28.3						69.2	23.1	7.7									
Gentamicin	Montevideo (95)	0.0	**0.0**	0.0-4.8					35.8	63.2	1.1										
	Dublin (40)	0.0	**10.0**	3.3-24.6					35.0	50.0	5.0				**5.0**	**5.0**					
	Muenster (33)	0.0	**0.0**	0.0-13.0					90.9	6.1	3.0										
	Newport (30)	0.0	**0.0**	0.0-14.1					86.7	13.3											
	Mbandaka (27)	0.0	**0.0**	0.0-15.5					33.3	66.7											
	Cerro (24)	0.0	**0.0**	0.0-17.2					66.7	33.3											
	Anatum (23)	0.0	**0.0**	0.0-17.8					100.0												
	Agona (17)	0.0	**0.0**	0.0-22.9					82.4	17.6											
	Meleagridis (17)	0.0	**0.0**	0.0-22.9					82.4	17.6											
	Typhimurium (14)	0.0	**14.3**	2.5-43.9					71.4	14.3					**7.1**	**7.1**					
	Infantis (13)	0.0	**0.0**	0.0-28.3					100.0												
Kanamycin	Montevideo (95)	0.0	**0.0**	0.0-4.8										100.0							
	Dublin (40)	0.0	**45.0**	29.6-61.3										52.5	2.5			**45.0**			
	Muenster (33)	0.0	**3.0**	0.2-17.5										97.0				**3.0**			
	Newport (30)	0.0	**10.0**	2.6-27.7										90.0			**3.3**	**6.7**			
	Mbandaka (27)	0.0	**0.0**	0.0-15.5										100.0							
	Cerro (24)	0.0	**0.0**	0.0-17.2										100.0							
	Anatum (23)	0.0	**0.0**	0.0-17.8										100.0							
	Agona (17)	0.0	**17.6**	4.6-44.1										82.4				**17.6**			
	Meleagridis (17)	0.0	**0.0**	0.0-22.9										100.0							
	Typhimurium (14)	0.0	**14.3**	2.5-43.9										85.7			**7.1**	**7.1**			
	Infantis (13)	0.0	**0.0**	0.0-28.3										100.0							
Streptomycin	Montevideo (95)	N/A	**0.0**	0.0-4.8												100.0					
	Dublin (40)	N/A	**62.5**	45.8-76.8												37.5	**2.5**	**60.0**			
	Muenster (33)	N/A	**6.1**	1.1-21.7												93.9		**6.1**			
	Newport (30)	N/A	**83.3**	64.5-93.7												16.7		**83.3**			
	Mbandaka (27)	N/A	**0.0**	0.0-15.5												100.0					
	Cerro (24)	N/A	**0.0**	0.0-17.2												100.0					
	Anatum (23)	N/A	**4.3**	0.2-23.9												95.7		**4.3**			
	Agona (17)	N/A	**64.7**	38.6-84.7												35.3		**64.7**			
	Meleagridis (17)	N/A	**0.0**	0.0-22.9												100.0					
	Typhimurium (14)	N/A	**42.9**	18.8-70.4												57.1	**21.4**	**21.4**			
	Infantis (13)	N/A	**0.0**	0.0-28.3												100.0					

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Montevideo (95)	0.0	**0.0**	0.0-4.8							98.9	1.1									
	Dublin (40)	0.0	**65.0**	48.3-78.9							22.5	10.0	2.5				**65.0**				
	Muenster (33)	0.0	**6.1**	1.1-21.7							90.9	3.0					**6.1**				
	Newport (30)	0.0	**76.7**	57.3-89.4							23.3						**76.7**				
	Mbandaka (27)	0.0	**3.7**	0.2-20.9							96.3						**3.7**				
	Cerro (24)	0.0	**0.0**	0.0-17.2							100.0										
	Anatum (23)	0.0	**4.3**	0.2-23.9							87.0	8.7					**4.3**				
	Agona (17)	0.0	**64.7**	38.6-84.7							35.3						**64.7**				
	Meleagridis (17)	0.0	**0.0**	0.0-22.9							94.1	5.9									
	Typhimurium (14)	0.0	**42.9**	18.8-70.4							57.1						**42.9**				
	Infantis (13)	0.0	**0.0**	0.0-28.3							100.0										
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Montevideo (95)	0.0	**0.0**	0.0-4.8							98.9	1.1									
	Dublin (40)	0.0	**50.0**	34.1-65.9							22.5	10.0	10.0	7.5		**5.0**	**45.0**				
	Muenster (33)	0.0	**3.0**	0.2-17.5							90.9	3.0	3.0			**3.0**					
	Newport (30)	0.0	**76.7**	57.3-89.4							23.3					**26.7**	**50.0**				
	Mbandaka (27)	0.0	**3.7**	0.2-20.9							92.6	3.7				**3.7**					
	Cerro (24)	0.0	**0.0**	0.0-17.2							100.0										
	Anatum (23)	0.0	**4.3**	0.2-23.9							91.3	4.3					**4.3**				
	Agona (17)	0.0	**64.7**	38.6-84.7							35.3						**64.7**				
	Meleagridis (17)	0.0	**0.0**	0.0-22.9							94.1	5.9									
	Typhimurium (14)	14.3	**21.4**	5.7-51.2							57.1			7.1	14.3		**21.4**				
	Infantis (13)	0.0	**0.0**	0.0-28.3							92.3	7.7									
Cephalosporins																					
Ceftiofur	Montevideo (95)	0.0	**0.0**	0.0-4.8						75.8	24.2										
	Dublin (40)	2.5	**47.5**	31.8-63.7					10.0	20.0	17.5	2.5	2.5	**17.5**	**30.0**						
	Muenster (33)	3.0	**3.0**	0.2-17.5						15.2	78.8		3.0		**3.0**						
	Newport (30)	0.0	**76.7**	57.3-89.4						13.3	6.7	3.3			**76.7**						
	Mbandaka (27)	0.0	**3.7**	0.2-20.9						3.7	92.6				**3.7**						
	Cerro (24)	0.0	**0.0**	0.0-17.2						66.7	29.2	4.2									
	Anatum (23)	8.7	**4.3**	0.2-23.9						52.2	30.4	4.3	8.7		**4.3**						
	Agona (17)	0.0	**64.7**	38.6-84.7							35.3				**64.7**						
	Meleagridis (17)	0.0	**0.0**	0.0-22.9						5.9	94.1										
	Typhimurium (14)	0.0	**21.4**	5.7-51.2						42.9	35.7			**7.1**	**14.3**						
	Infantis (13)	0.0	**0.0**	0.0-28.3							100.0										
Ceftriaxone	Montevideo (95)	0.0	**0.0**	0.0-4.8					100.0												
	Dublin (40)	45.0	**0.0**	0.0-10.9					50.0				2.5	2.5	35.0	10.0					
	Muenster (33)	3.0	**0.0**	0.0-13.0					93.9	3.0					3.0						
	Newport (30)	66.7	**6.7**	1.2-23.6					23.3					3.3	33.3	33.3	**6.7**				
	Mbandaka (27)	0.0	**0.0**	0.0-15.5					96.3					3.7							
	Cerro (24)	0.0	**0.0**	0.0-17.2					100.0												
	Anatum (23)	4.3	**0.0**	0.0-17.8					82.6		4.3	4.3		4.3	4.3						
	Agona (17)	64.7	**0.0**	0.0-22.9					35.3						47.1	17.6					
	Meleagridis (17)	0.0	**0.0**	0.0-22.9					100.0												
	Typhimurium (14)	14.3	**0.0**	0.0-26.8					78.6					7.1	14.3						
	Infantis (13)	0.0	**0.0**	0.0-28.3					100.0												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2007

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
Cephamycins																					
Cefoxitin	Montevideo (95)	0.0	**0.0**	0.0-4.8							10.5	70.5	15.8	3.2							
	Dublin (40)	2.5	**47.5**	31.8-63.7							10.0	2.5	17.5	20.0	2.5		**47.5**				
	Muenster (33)	3.0	**3.0**	0.2-17.5									72.7	21.2	3.0	**3.0**					
	Newport (30)	0.0	**76.7**	57.3-89.4								16.7	6.7			**30.0**	**46.7**				
	Mbandaka (27)	3.7	**0.0**	0.0-15.5								3.7	81.5	11.1	3.7						
	Cerro (24)	0.0	**0.0**	0.0-17.2							20.8	58.3	20.8								
	Anatum (23)	8.7	**4.3**	0.2-23.9									69.6	17.4	8.7		**4.3**				
	Agona (17)	0.0	**64.7**	38.6-84.7									29.4	5.9			**64.7**				
	Meleagridis (17)	0.0	**0.0**	0.0-22.9									76.5	23.5							
	Typhimurium (14)	0.0	**21.4**	5.7-51.2								71.4	7.1			**21.4**					
	Infantis (13)	0.0	**0.0**	0.0-28.3						7.7			69.2	23.1							
Folate Pathway Inhibitors																					
Sulfonamides	Montevideo (95)	N/A	**1.1**	0.1-6.6											46.3	48.4	4.2			**1.1**	
	Dublin (40)	N/A	**70.0**	53.3-82.9											27.5		2.5			**70.0**	
	Muenster (33)	N/A	**6.1**	1.1-21.7												66.7	27.3			**6.1**	
	Newport (30)	N/A	**83.3**	64.5-93.7												16.7				**83.3**	
	Mbandaka (27)	N/A	**0.0**	0.0-15.5											7.4	59.3	29.6	3.7			
	Cerro (24)	N/A	**0.0**	0.0-17.2											20.8	58.3	20.8				
	Anatum (23)	N/A	**4.3**	0.2-23.9											43.5	43.5	8.7			**4.3**	
	Agona (17)	N/A	**64.7**	38.6-84.7											17.6	17.6				**64.7**	
	Meleagridis (17)	N/A	**0.0**	0.0-22.9											35.3	47.1	17.6				
	Typhimurium (14)	N/A	**50.0**	24.0-76.0												42.9	7.1			**50.0**	
	Infantis (13)	N/A	**0.0**	0.0-28.3											23.1	69.2	7.7				
Trimethoprim-Sulfamethoxazole	Montevideo (95)	N/A	**1.1**	0.1-6.6				85.3	13.7					**1.1**							
	Dublin (40)	N/A	**10.0**	3.3-24.6				30.0	27.5	22.5	7.5	2.5	**5.0**	**5.0**							
	Muenster (33)	N/A	**0.0**	0.0-13.0				78.8	18.2	3.0											
	Newport (30)	N/A	**13.3**	4.3-31.6				40.0	43.3		3.3			**13.3**							
	Mbandaka (27)	N/A	**0.0**	0.0-15.5				88.9	11.1												
	Cerro (24)	N/A	**0.0**	0.0-17.2				91.7	8.3												
	Anatum (23)	N/A	**0.0**	0.0-17.8				78.3	21.7												
	Agona (17)	N/A	**11.8**	2.1-37.8				58.8	23.5	5.9				**11.8**							
	Meleagridis (17)	N/A	**0.0**	0.0-22.9				88.2	11.8												
	Typhimurium (14)	N/A	**0.0**	0.0-26.8				57.1	14.3	28.6											
	Infantis (13)	N/A	**0.0**	0.0-28.3				92.3	7.7												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Phenicols																					
Chloramphenicol	Montevideo (95)	0.0	**0.0**	0.0-4.8									31.6	68.4							
	Dublin (40)	5.0	**70.0**	53.3-82.9								5.0	15.0	5.0	5.0		**70.0**				
	Muenster (33)	0.0	**6.1**	1.1-21.7									21.2	72.7			**6.1**				
	Newport (30)	0.0	**76.7**	57.3-89.4									6.7	16.7			**76.7**				
	Mbandaka (27)	3.7	**0.0**	0.0-15.5									3.7	92.6	3.7						
	Cerro (24)	0.0	**0.0**	0.0-17.2									87.5	12.5							
	Anatum (23)	0.0	**0.0**	0.0-17.8									26.1	73.9							
	Agona (17)	0.0	**64.7**	38.6-84.7										35.3			**64.7**				
	Meleagridis (17)	0.0	**0.0**	0.0-22.9									64.7	35.3							
	Typhimurium (14)	0.0	**50.0**	24.0-76.0									14.3	35.7			**50.0**				
	Infantis (13)	0.0	**0.0**	0.0-28.3									7.7	92.3							
Quinolones																					
Ciprofloxacin	Montevideo (95)	0.0	**0.0**	0.0-4.8	84.2	12.6	3.2														
	Dublin (40)	0.0	**0.0**	0.0-10.9	40.0	52.5		2.5		5.0											
	Muenster (33)	0.0	**0.0**	0.0-13.0	78.8	18.2	3.0														
	Newport (30)	0.0	**0.0**	0.0-14.1	83.3	16.7															
	Mbandaka (27)	0.0	**0.0**	0.0-15.5	77.8	22.2															
	Cerro (24)	0.0	**0.0**	0.0-17.2	91.7	8.3															
	Anatum (23)	0.0	**0.0**	0.0-17.8	73.9	26.1															
	Agona (17)	0.0	**0.0**	0.0-22.9	82.4	17.6															
	Meleagridis (17)	0.0	**0.0**	0.0-22.9	76.5	23.5															
	Typhimurium (14)	0.0	**0.0**	0.0-26.8	71.4	28.6															
	Infantis (13)	0.0	**0.0**	0.0-28.3	84.6		15.4														
Nalidixic Acid	Montevideo (95)	N/A	**0.0**	0.0-4.8								65.3	23.2	11.6							
	Dublin (40)	N/A	**7.5**	2.0-21.5							2.5	20.0	62.5	7.5		**2.5**	**5.0**				
	Muenster (33)	N/A	**0.0**	0.0-13.0								21.2	66.7	12.1							
	Newport (30)	N/A	**0.0**	0.0-14.1								70.0	20.0	10.0							
	Mbandaka (27)	N/A	**0.0**	0.0-15.5								74.1	11.1	14.8							
	Cerro (24)	N/A	**0.0**	0.0-17.2								70.8	29.2								
	Anatum (23)	N/A	**0.0**	0.0-17.8								4.3	69.6	26.1							
	Agona (17)	N/A	**0.0**	0.0-22.9								17.6	76.5	5.9							
	Meleagridis (17)	N/A	**0.0**	0.0-22.9								11.8	64.7	23.5							
	Typhimurium (14)	N/A	**0.0**	0.0-26.8								14.3	57.1	28.6							
	Infantis (13)	N/A	**0.0**	0.0-28.3								61.5	23.1	15.4							
Tetracyclines																					
Tetracycline	Montevideo (95)	1.1	**7.4**	3.3-15.1									91.6	1.1	**1.1**	**1.1**	**5.3**				
	Dublin (40)	0.0	**72.5**	55.9-84.9									27.5			**2.5**	**70.0**				
	Muenster (33)	3.0	**9.1**	2.4-25.5									87.9	3.0	**3.0**		**6.1**				
	Newport (30)	0.0	**86.7**	68.4-95.7									13.3			**3.3**	**83.3**				
	Mbandaka (27)	0.0	**3.7**	0.2-20.9									96.3			**3.7**					
	Cerro (24)	0.0	**0.0**	0.0-17.2									100.0								
	Anatum (23)	4.3	**26.1**	11.1-48.7									69.6	4.3		**17.4**	**8.7**				
	Agona (17)	0.0	**64.7**	38.6-84.7									35.3				**64.7**				
	Meleagridis (17)	0.0	**5.9**	0.3-30.8									94.1				**5.9**				
	Typhimurium (14)	0.0	**50.0**	24.0-76.0									50.0			**14.3**	**35.7**				
	Infantis (13)	0.0	**0.0**	0.0-28.3									100.0								

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 8A. Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Swine, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (μg/ml)[4]																
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Derby (29)	0.0	**0.0**	0.0-14.6						10.3	58.6	24.1	6.9								
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-16.0						19.2	65.4	15.4									
	Johannesburg (22)	0.0	**0.0**	0.0-18.5							90.9	4.5	4.5								
	Typhimurium (18)	0.0	**5.6**	0.3-29.4						5.6	61.1	22.2	5.6					**5.6**			
	Infantis (17)	0.0	**0.0**	0.0-22.9						41.2	58.8										
	Saintpaul (12)	0.0	**0.0**	0.0-30.1							100.0										
	London (10)	0.0	**0.0**	0.0-34.5						40.0	60.0										
	Anatum (10)	0.0	**0.0**	0.0-34.5						10.0	70.0	20.0									
	Adelaide (10)	0.0	**0.0**	0.0-34.5							70.0	20.0	10.0								
	Hadar (9)	0.0	**0.0**	0.0-37.1						11.1	77.8	11.1									
	Agona (8)	0.0	**0.0**	0.0-40.2						12.5	75.0		12.5								
Gentamicin	Derby (29)	0.0	**0.0**	0.0-34.5					100.0												
	Typhimurium var. 5- (26)	5.9	**0.0**	0.0-22.9					76.5	17.6				5.9							
	Johannesburg (22)	0.0	**0.0**	0.0-37.1					66.7	33.3											
	Typhimurium (18)	0.0	**0.0**	0.0-18.5					81.8	18.2											
	Infantis (17)	0.0	**0.0**	0.0-16.0					92.3	7.7											
	Saintpaul (12)	0.0	**0.0**	0.0-34.5					100.0												
	London (10)	0.0	**0.0**	0.0-14.6					65.5	34.5											
	Anatum (10)	0.0	**0.0**	0.0-30.1					100.0												
	Adelaide (10)	0.0	**12.5**	0.7-53.3					37.5	50.0					**12.5**						
	Hadar (9)	0.0	**0.0**	0.0-34.5					70.0	30.0											
	Agona (8)	0.0	**5.6**	0.3-29.4					72.2	22.2						**5.6**					
Kanamycin	Derby (29)	0.0	**3.4**	0.2-19.6										96.6				**3.4**			
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-30.1										100.0							
	Johannesburg (22)	0.0	**0.0**	0.0-34.5										100.0							
	Typhimurium (18)	0.0	**0.0**	0.0-37.1										100.0							
	Infantis (17)	0.0	**11.1**	1.9-36.1										88.9				**11.1**			
	Saintpaul (12)	0.0	**0.0**	0.0-34.5										100.0							
	London (10)	0.0	**0.0**	0.0-34.5										100.0							
	Anatum (10)	0.0	**5.9**	0.3-30.8										94.1				**5.9**			
	Adelaide (10)	0.0	**9.1**	1.6-30.6										90.9				**9.1**			
	Hadar (9)	0.0	**25.0**	4.5-64.4										75.0				**25.0**			
	Agona (8)	0.0	**7.7**	1.3-26.6										92.3				**7.7**			
Streptomycin	Derby (29)	N/A	**0.0**	0.0-18.5												100.0					
	Typhimurium var. 5- (26)	N/A	**48.3**	29.9-67.1												51.7	**6.9**	**41.4**			
	Johannesburg (22)	N/A	**0.0**	0.0-30.1												100.0					
	Typhimurium (18)	N/A	**0.0**	0.0-34.5												100.0					
	Infantis (17)	N/A	**0.0**	0.0-34.5												100.0					
	Saintpaul (12)	N/A	**50.0**	17.4-82.6												50.0	**25.0**	**25.0**			
	London (10)	N/A	**66.7**	30.9-91.0												33.3	**66.7**				
	Anatum (10)	N/A	**0.0**	0.0-34.5												100.0					
	Adelaide (10)	N/A	**65.4**	44.4-82.1												34.6	**65.4**				
	Hadar (9)	N/A	**50.0**	26.8-73.2												50.0	**33.3**	**16.7**			
	Agona (8)	N/A	**0.0**	0.0-22.9												100.0					

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 8A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Swine, 2007

					Distribution (%) of MICs (µg/ml)[4]																
Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Derby (29)	0.0	**10.0**	0.5-45.9							90.0						**10.0**				
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-22.9							88.2	11.8									
	Johannesburg (22)	0.0	**0.0**	0.0-30.1							91.7	8.3									
	Typhimurium (18)	0.0	**0.0**	0.0-37.1							88.9	11.1									
	Infantis (17)	0.0	**37.5**	10.2-74.1							62.5					**12.5**	**25.0**				
	Saintpaul (12)	0.0	**3.4**	0.2-19.6							86.2	10.3					**3.4**				
	London (10)	0.0	**0.0**	0.0-34.5							100.0										
	Anatum (10)	0.0	**55.6**	31.4-77.6							27.8	11.1	5.6				**55.6**				
	Adelaide (10)	0.0	**0.0**	0.0-34.5							100.0										
	Hadar (9)	0.0	**80.8**	60.0-92.7							19.2						**80.8**				
	Agona (8)	0.0	**9.1**	1.6-30.6							90.9						**9.1**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Derby (29)	0.0	**0.0**	0.0-34.5							100.0										
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-34.5							100.0										
	Johannesburg (22)	0.0	**0.0**	0.0-22.9							100.0										
	Typhimurium (18)	0.0	**10.0**	0.5-45.9							90.0						**10.0**				
	Infantis (17)	0.0	**0.0**	0.0-37.1							100.0										
	Saintpaul (12)	0.0	**0.0**	0.0-30.1							100.0										
	London (10)	0.0	**37.5**	10.2-74.1							62.5					**25.0**	**12.5**				
	Anatum (10)	61.5	**0.0**	0.0-16.0							19.2			19.2	61.5						
	Adelaide (10)	0.0	**0.0**	0.0-14.6							96.6			3.4							
	Hadar (9)	0.0	**9.1**	1.6-30.6							86.4	4.5					**9.1**				
	Agona (8)	44.4	**5.6**	0.3-29.4							44.4			5.6	44.4		**5.6**				
Cephalosporins																					
Ceftiofur	Derby (29)	0.0	**0.0**	0.0-22.9							100.0										
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-34.5						60.0	40.0										
	Johannesburg (22)	0.0	**5.6**	0.3-29.4						50.0	38.9	5.6			**5.6**						
	Typhimurium (18)	0.0	**0.0**	0.0-34.5						20.0	80.0										
	Infantis (17)	0.0	**0.0**	0.0-30.1						66.7	33.3										
	Saintpaul (12)	0.0	**9.1**	1.6-30.6						86.4	4.5				**9.1**						
	London (10)	25.0	**12.5**	0.7-53.3							62.5		25.0		**12.5**						
	Anatum (10)	0.0	**0.0**	0.0-37.1						33.3	66.7										
	Adelaide (10)	0.0	**10.0**	0.5-45.9						20.0	70.0			**10.0**							
	Hadar (9)	0.0	**0.0**	0.0-14.6						13.8	86.2										
	Agona (8)	0.0	**0.0**	0.0-16.0						42.3	53.8	3.8									
Ceftriaxone	Derby (29)	0.0	**0.0**	0.0-16.0					100.0												
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-22.9					100.0												
	Johannesburg (22)	0.0	**0.0**	0.0-37.1					100.0												
	Typhimurium (18)	0.0	**12.5**	0.7-53.3					62.5			25.0					**12.5**				
	Infantis (17)	0.0	**0.0**	0.0-30.1					100.0												
	Saintpaul (12)	9.1	**0.0**	0.0-18.5					90.9						9.1						
	London (10)	5.6	**0.0**	0.0-21.9					94.4						5.6						
	Anatum (10)	0.0	**0.0**	0.0-34.5					100.0												
	Adelaide (10)	0.0	**0.0**	0.0-34.5					100.0												
	Hadar (9)	10.0	**0.0**	0.0-34.5					90.0						10.0						
	Agona (8)	0.0	**0.0**	0.0-14.6					100.0												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 8A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Swine, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
					Distribution (%) of MICs (µg/ml)[4]																
Cephamycins																					
Cefoxitin	Derby (29)	0.0	**0.0**	0.0-14.6								3.4	79.3	17.2							
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-34.5							20.0	80.0									
	Johannesburg (22)	0.0	**12.5**	0.7-53.3									50.0	37.5			**12.5**				
	Typhimurium (18)	0.0	**0.0**	0.0-16.0								61.5	30.8	7.7							
	Infantis (17)	0.0	**11.1**	1.9-36.1							5.6	66.7	16.7			**5.6**	**5.6**				
	Saintpaul (12)	0.0	**0.0**	0.0-30.1							16.7	83.3									
	London (10)	0.0	**0.0**	0.0-22.9									88.2	11.8							
	Anatum (10)	0.0	**10.0**	0.5-45.9									90.0			**10.0**					
	Adelaide (10)	0.0	**9.1**	1.6-30.6								68.2	22.7			**9.1**					
	Hadar (9)	0.0	**0.0**	0.0-34.5									80.0	20.0							
	Agona (8)	0.0	**0.0**	0.0-37.1								88.9	11.1								
Folate Pathway Inhibitors																					
Sulfonamides	Derby (29)	N/A	**88.5**	68.8-97.0												11.5				**88.5**	
	Typhimurium var. 5- (26)	N/A	**55.2**	36.0-73.1											3.4	27.6	13.8			**55.2**	
	Johannesburg (22)	N/A	**0.0**	0.0-22.9											52.9	41.2	5.9				
	Typhimurium (18)	N/A	**0.0**	0.0-34.5											10.0	70.0	20.0				
	Infantis (17)	N/A	**10.0**	0.5-45.9											20.0	60.0	10.0			**10.0**	
	Saintpaul (12)	N/A	**62.5**	25.9-89.8											25.0	12.5				**62.5**	
	London (10)	N/A	**0.0**	0.0-30.1											91.7	8.3					
	Anatum (10)	N/A	**61.1**	36.1-81.7											16.7	16.7	5.6			**61.1**	
	Adelaide (10)	N/A	**0.0**	0.0-37.1											77.8	22.2					
	Hadar (9)	N/A	**0.0**	0.0-34.5											90.0	10.0					
	Agona (8)	N/A	**4.5**	0.2-24.8											77.3	18.2				**4.5**	
Trimethoprim-Sulfamethoxazole	Derby (29)	N/A	**0.0**	0.0-34.5				90.0	10.0												
	Typhimurium var. 5- (26)	N/A	**0.0**	0.0-34.5				50.0	50.0												
	Johannesburg (22)	N/A	**0.0**	0.0-34.5				100.0													
	Typhimurium (18)	N/A	**0.0**	0.0-30.1				91.7	8.3												
	Infantis (17)	N/A	**0.0**	0.0-37.1				100.0													
	Saintpaul (12)	N/A	**0.0**	0.0-22.9				76.5	23.5												
	London (10)	N/A	**11.5**	3.0-31.2				34.6	26.9	19.2	7.7			**11.5**							
	Anatum (10)	N/A	**5.6**	0.3-29.4				61.1	33.3					**5.6**							
	Adelaide (10)	N/A	**0.0**	0.0-40.2				75.0	25.0												
	Hadar (9)	N/A	**0.0**	0.0-18.5				86.4	13.6												
	Agona (8)	N/A	**0.0**	0.0-14.6				55.2	37.9	3.4	3.4										

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 8A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Swine, 2007

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4]																
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Phenicols																					
Chloramphenicol	Derby (29)	3.4	**0.0**	0.0-14.6										96.6	3.4						
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-30.1									58.3	41.7							
	Johannesburg (22)	0.0	**0.0**	0.0-22.9										100.0							
	Typhimurium (18)	3.8	**73.1**	52.0-87.7										23.1	3.8		**73.1**				
	Infantis (17)	0.0	**0.0**	0.0-34.5										100.0							
	Saintpaul (12)	0.0	**4.5**	0.2-24.8									27.3	68.2			**4.5**				
	London (10)	0.0	**0.0**	0.0-34.5										100.0							
	Anatum (10)	0.0	**25.0**	4.5-64.4									12.5	62.5			**25.0**				
	Adelaide (10)	0.0	**0.0**	0.0-37.1								11.1	77.8	11.1							
	Hadar (9)	5.6	**55.6**	31.4-77.6									11.1	27.8	5.6		**55.6**				
	Agona (8)	0.0	**0.0**	0.0-34.5									90.0	10.0							
Quinolones																					
Ciprofloxacin	Derby (29)	0.0	**0.0**	0.0-18.5	90.9	9.1															
	Typhimurium var. 5- (26)	0.0	**0.0**	0.0-16.0	69.2	30.8															
	Johannesburg (22)	0.0	**0.0**	0.0-22.9	76.5	23.5															
	Typhimurium (18)	0.0	**0.0**	0.0-30.1	100.0																
	Infantis (17)	0.0	**0.0**	0.0-21.9	88.9		11.1														
	Saintpaul (12)	0.0	**0.0**	0.0-37.1	88.9	11.1															
	London (10)	0.0	**0.0**	0.0-34.5	70.0	30.0															
	Anatum (10)	0.0	**0.0**	0.0-34.5	90.0	10.0															
	Adelaide (10)	0.0	**0.0**	0.0-34.5	90.0	10.0															
	Hadar (9)	0.0	**0.0**	0.0-14.6	86.2	13.8															
	Agona (8)	0.0	**0.0**	0.0-40.2	87.5	12.5															
Nalidixic Acid	Derby (29)	N/A	**0.0**	0.0-18.5								40.9	59.1								
	Typhimurium var. 5- (26)	N/A	**0.0**	0.0-34.5								10.0	90.0								
	Johannesburg (22)	N/A	**0.0**	0.0-21.9								33.3	55.6	5.6	5.6						
	Typhimurium (18)	N/A	**0.0**	0.0-16.0								23.1	46.2	30.8							
	Infantis (17)	N/A	**0.0**	0.0-37.1								44.4	44.4	11.1							
	Saintpaul (12)	N/A	**0.0**	0.0-34.5								70.0	20.0	10.0							
	London (10)	N/A	**0.0**	0.0-14.6								55.2	34.5	10.3							
	Anatum (10)	N/A	**0.0**	0.0-40.2							25.0	25.0	37.5	12.5							
	Adelaide (10)	N/A	**0.0**	0.0-30.1								33.3	66.7								
	Hadar (9)	N/A	**0.0**	0.0-22.9								52.9	35.3	11.8							
	Agona (8)	N/A	**0.0**	0.0-34.5								30.0	60.0	10.0							
Tetracyclines																					
Tetracycline	Derby (29)	0.0	**60.0**	27.4-86.3									40.0			**10.0**	**50.0**				
	Typhimurium var. 5- (26)	0.0	**75.0**	35.6-95.5									25.0			**25.0**	**50.0**				
	Johannesburg (22)	0.0	**0.0**	0.0-34.5									100.0								
	Typhimurium (18)	0.0	**75.9**	56.1-89.0									24.1		**3.4**		**72.4**				
	Infantis (17)	0.0	**0.0**	0.0-34.5									100.0								
	Saintpaul (12)	0.0	**92.3**	73.4-98.7									7.7		**3.8**	**46.2**	**42.3**				
	London (10)	0.0	**0.0**	0.0-30.1									100.0								
	Anatum (10)	5.6	**83.3**	57.7-95.6									11.1	5.6	**5.6**	**38.9**	**38.9**				
	Adelaide (10)	0.0	**100.0**	62.9-100												**11.1**	**88.9**				
	Hadar (9)	0.0	**54.5**	32.6-74.9									45.5				**54.5**				
	Agona (8)	0.0	**11.8**	2.1-37.8									88.2		**5.9**		**5.9**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 9A. *Salmonella* Typhimurium with ACSSuT or ACSuT Resistance Pattern, 2007

	Typhimurium	Percent of		Typhimurium variant 5-	Percent of		Total	Percent of	
		Typhimurium n=69	Total n=1915		Typhimurium variant 5- n=90	Total n=1915		All Typhimurium n=159	Total n=1915
Resustance Pattern									
A C S Su T (penta-resistant)	15	21.7	0.8	22	24.4	1.1	37	23.3	1.9
A C Su T (quadra-resistant)	4	5.8	0.2	9	10.0	0.5	13	8.2	0.7
Total	**19**	**27.5**	**1.0**	**31**	**34.4**	**1.6**	**50**	**31.4**	**2.6**

Table 10A. *Salmonella* Typhimurium that were DT104 or DT104 Complex Isolates, 2007

	Typhimurium	Percent of		Typhimurium variant 5-	Percent of		Total	Percent of	
		Typhimurium n=69	Total n=1915		Typhimurium variant 5- n=90	Total n=1915		All Typhimurium n=159	Total n=1915
A C S Su T (penta-resistant)[a]									
DT104	4	5.8	0.2	9	10.0	0.5	13	8.2	0.7
DT104A	0	0.0	0.0	1	1.1	0.1	1	0.6	0.1
DT104B	0	0.0	0.0	2	2.2	0.1	2	1.3	0.1
Total	**4**	**5.8**	**0.2**	**12**	**13.3**	**0.6**	**16**	**10.1**	**0.8**

[a] Two *S*. Typhimurium ACSuT resistant isolates were confirmed DT104 and 1 was confirmed DT104A. Three *S*. Typhimurium variant 5- ACSuT resistant were confirmed DT104 and 2 were confirmed DT104

Table 11A. Phage Types other than DT104 for *S.* Typhimurium with ACSSuT or ACSuT Resistance Pattern, 2007

	Typhimurium	Percent of		Typhimurium variant 5-	Percent of		Total	Percent of	
		Typhimurium n=69	Total n=1915		Typhimurium variant 5- n=90	Total n=1915		All Typhimurium n=159	Total n=1915
A C S Su T (penta-resistant)[b]									
DT12	1	1.4	0.1	0	0.0	0.0	1	0.6	0.1
DT67	2	2.9	0.1	0	0.0	0.0	2	1.3	0.1
DT193	1	1.4	0.1	2	2.2	0.1	3	1.9	0.2
DT208	0	0.0	0.0	2	2.2	0.1	2	1.3	0.1
RDNC	2	2.9	0.1	0	0.0	0.0	2	1.3	0.1
U302	0	0.0	0.0	4	4.4	0.2	4	2.5	0.2
Untypable	4	5.8	0.2	3	3.3	0.2	7	4.4	0.4
Total	**10**	**14.5**	**0.5**	**11**	**12.2**	**0.6**	**21**	**13.2**	**1.1**

[a] One *S*. Typhimurium and 4 *S*. Typhimurium variant 5- ACSuT resistant were phage type U302

Table 12A. Confirmed *S.* Typhimurium DT104[1,2] Isolates, 1997-2007

Year	Chicken			Turkey			Cattle			Swine		
	n	% (*S*.Typhimurium)	% (Chicken)	n	% (*S*.Typhimurium)	% (Turkey)	n	% (*S*.Typhimurium)	% (Cattle)	n	% (*S*.Typhimurium)	% (Swine)
1997	4	16.7	1.9	0	0.0	0.0	1	50.0	4.2	11	44.0	9.9
1998	11	16.7	2.0	0	0.0	0.0	2	6.1	0.7	48	45.7	6.1
1999	12	7.8	0.8	2	5.4	0.3	37	19.6	2.3	34	29.8	3.9
2000	18	12.4	1.5	3	16.7	0.6	46	24.6	3.3	25	30.9	5.5
2001	14	10.8	1.1	2	13.3	0.4	20	23.0	2.2	15	34.1	3.6
2002	16	10.7	1.1	1	11.1	0.4	21	21.4	2.1	13	27.1	3.4
2003	4	2.6	0.3	1	16.7	0.4	10	12.8	1.5	8	29.6	3.8
2004	3	1.8	0.2	0	0.0	0.0	14	29.2	2.3	11	20.8	3.6
2005	9	4.9	0.5	2	28.6	0.9	7	20.6	2.1	12	28.6	4.0
2006	8	7.6	0.6	3	60.0	1.0	5	22.7	1.3	8	32.0	2.6
2007	1	1.2	0.1	3	50.0	1.1	7	26.9	1.6	13	29.5	6.2

[1] Includes isolates that are DT104 complex (A or B)
[2] Includes *S.* Typhimurium and *S*.Typhimurium variant 5-

Table 13A. MDR of *Salmonella* from Chicken, 1997-2007

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994
Resistance Pattern											
No Resistance Detected	52.8% 113	58.6% 329	58.8% 846	57.1% 670	66.7% 872	62.0% 930	61.1% 708	62.7% 803	61.2% 1217	57.3% 791	53.9% 536
Resistance ≥1 CLSI Subclass[1]	47.2% 101	41.4% 232	41.2% 592	42.9% 503	33.3% 435	38.0% 570	38.9% 450	37.3% 477	38.8% 772	42.7% 589	46.1% 458
Resistance ≥2 CLSI Subclasses[1]	28.0% 60	30.7% 172	31.9% 459	32.2% 378	25.2% 330	28.3% 424	27.0% 313	31.2% 399	31.2% 621	31.4% 434	30.2% 300
Resistance ≥3 CLSI Subclasses[1]	9.8% 21	13.4% 75	12.3% 177	15.0% 176	10.2% 133	14.2% 213	13.5% 156	15.8% 202	15.1% 301	16.3% 225	17.8% 177
Resistance ≥4 CLSI Subclasses[1]	3.3% 7	3.9% 22	4.9% 71	6.7% 79	3.6% 47	7.6% 114	6.8% 79	9.8% 126	8.7% 173	10.3% 142	12.2% 121
Resistance ≥5 CLSI Subclasses[1]	1.4% 3	2.7% 15	3.0% 43	5.5% 64	3.1% 41	5.7% 85	4.9% 57	8.0% 103	5.9% 117	6.4% 89	7.2% 72
At Least ACSSuT[2]	1.4% 3	2.7% 15	1.7% 24	4.3% 50	2.4% 32	1.9% 29	1.5% 17	0.9% 12	1.6% 31	1.6% 22	1.5% 15
At Least ACT/S[3]	0.0% 0	0.2% 1	0.1% 2	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.1% 1	0.1% 2	0.0% 0	0.0% 0
At Least ACSSuTAuCf[4]	0.0% 0	0.5% 3	0.3% 5	2.7% 32	1.1% 14	0.9% 13	1.0% 12	0.4% 5	0.9% 18	1.1% 15	1.4% 14
At Least Ceftiofur and Nalidixic Acid Resistant	0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.0% 0	0.6% 9	0.1% 1	0.2% 3	0.1% 1	0.0% 0	0.0% 0

Table 14A. MDR of *Salmonella* from Turkey, 1997-2007

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	107	240	713	518	550	244	262	236	227	304	271
Resistance Pattern											
No Resistance Detected	32.7% 35	41.3% 99	32.5% 232	33.4% 173	31.6% 174	29.9% 73	24.0% 63	33.9% 80	27.8% 63	28.6% 85	15.5% 42
Resistance ≥1 CLSI Subclass[1]	67.3% 72	58.8% 141	67.5% 481	66.6% 345	68.4% 376	70.1% 171	76.0% 199	66.1% 156	72.2% 164	71.4% 219	84.5% 229
Resistance ≥2 CLSI Subclasses[1]	48.6% 52	45.0% 108	53.3% 380	51.0% 264	56.2% 309	46.3% 113	42.7% 112	50.0% 118	53.3% 121	37.5% 141	60.1% 163
Resistance ≥3 CLSI Subclasses[1]	25.2% 27	23.8% 57	26.2% 187	21.6% 112	30.4% 167	24.2% 59	21.8% 57	27.1% 64	28.2% 64	22.7% 83	33.6% 91
Resistance ≥4 CLSI Subclasses[1]	5.6% 6	6.3% 15	10.8% 77	10.0% 52	14.7% 81	11.1% 27	9.5% 25	10.2% 24	11.5% 26	11.8% 37	15.1% 41
Resistance ≥5 CLSI Subclasses[1]	4.7% 5	0.8% 2	5.0% 36	4.8% 25	6.0% 33	6.6% 16	3.1% 8	5.5% 13	6.2% 14	4.9% 18	7.0% 19
At Least ACSSuT[2]	3.7% 4	0.8% 2	3.8% 27	3.3% 17	3.6% 20	4.5% 11	2.3% 6	4.7% 11	4.0% 9	3.9% 12	4.8% 13
At Least ACT/S[3]	0.0% 0	0.4% 1	0.4% 3	0.8% 4	0.7% 4	0.8% 2	0.0% 0	0.4% 1	0.0% 0	0.3% 1	0.0% 0
At Least ACSSuTAuCf[4]	3.7% 4	0.4% 1	3.4% 24	1.9% 10	2.9% 16	1.6% 4	0.8% 2	2.1% 5	1.8% 4	2.3% 7	4.1% 11
At Least Ceftiofur and Nalidixic Acid Resistant	1.9% 2	0.0% 0	2.7% 19	1.2% 6	1.5% 8	1.2% 3	0.4% 1	0.8% 2	0.9% 2	0.3% 1	0.7% 2

[1]CLSI: Clinical and Laboratory Standards Institute M100 Document
[2]ACSSuT: resistance to at least ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
[3]ACT/S: resistance to at least ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
[4]ACSSuTAuCf: resistance to at least ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

Table 15A. MDR of *Salmonella* from Cattle, 1997-2007

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	24	284	1610	1388	893	1008	670	607	329	389	439
Resistance Pattern											
No Resistance Detected	66.7%	73.6%	74.5%	70.1%	70.0%	64.3%	61.0%	65.7%	63.2%	67.6%	72.0%
	16	209	1200	973	625	648	409	399	208	263	316
Resistance ≥1 CLSI Subclass[1]	33.3%	26.4%	25.5%	29.9%	30.0%	35.7%	39.0%	34.3%	36.8%	32.4%	28.0%
	8	75	410	415	268	360	261	208	121	126	123
Resistance ≥2 CLSI Subclasses[1]	20.8%	17.3%	15.8%	21.8%	21.5%	27.9%	31.8%	23.9%	28.6%	26.0%	22.8%
	5	49	254	303	192	281	213	145	94	101	100
Resistance ≥3 CLSI Subclasses[1]	12.5%	13.7%	13.3%	19.8%	18.9%	24.5%	29.6%	21.1%	27.7%	23.9%	22.1%
	3	39	214	275	169	247	198	128	91	93	97
Resistance ≥4 CLSI Subclasses[1]	8.3%	9.2%	10.9%	17.4%	16.9%	22.1%	27.3%	18.8%	24.9%	22.1%	21.0%
	2	26	175	242	151	223	183	114	82	86	92
Resistance ≥5 CLSI Subclasses[1]	4.2%	4.6%	8.0%	14.0%	15.1%	19.3%	23.6%	17.8%	23.1%	20.1%	18.9%
	1	13	128	195	135	195	158	108	76	78	83
At Least ACSSuT[2]	4.2%	4.2%	7.6%	13.1%	14.6%	17.1%	18.1%	16.3%	20.4%	18.3%	16.2%
	1	12	123	182	130	172	121	99	67	71	71
At Least ACT/S[3]	0.0%	2.1%	2.2%	1.7%	2.4%	2.4%	2.7%	1.2%	4.3%	4.1%	2.5%
	0	6	35	23	21	24	18	7	14	16	11
At Least ACSSuTAuCf[4]	0.0%	2.1%	3.7%	8.9%	11.0%	14.6%	15.1%	11.9%	17.6%	16.2%	13.7%
	0	6	59	124	98	147	101	72	58	63	60
At Least Ceftiofur and Nalidixic	0.0%	0.0%	0.1%	0.1%	0.3%	0.2%	0.4%	1.0%	0.9%	0.3%	0.2%
Acid Resistant	0	0	1	1	3	2	3	6	3	1	1

Table 16A. MDR of *Salmonella* from Swine, 1997-2007

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	111	793	876	451	418	379	211	308	301	304	211
Resistance Pattern											
No Resistance Detected	44.1%	49.2%	48.9%	43.2%	43.5%	40.4%	53.6%	37.3%	44.5%	34.5%	43.1%
	49	390	428	195	182	153	113	115	134	105	91
Resistance ≥1 CLSI Subclass[1]	55.9%	50.8%	51.1%	56.8%	56.5%	59.6%	46.4%	62.7%	55.5%	65.5%	56.9%
	62	403	448	256	236	226	98	193	167	199	120
Resistance ≥2 CLSI Subclasses[1]	43.2%	34.4%	35.3%	44.6%	40.2%	43.3%	32.7%	41.2%	40.5%	36.2%	37.9%
	48	273	309	201	168	164	69	127	122	110	80
Resistance ≥3 CLSI Subclasses[1]	26.1%	24.0%	26.4%	34.6%	30.6%	34.0%	23.7%	33.1%	31.9%	22.7%	28.0%
	29	190	231	156	128	129	50	102	96	69	59
Resistance ≥4 CLSI Subclasses[1]	15.3%	11.2%	9.8%	17.3%	9.1%	12.7%	10.9%	15.3%	13.3%	9.5%	17.5%
	17	89	86	78	38	48	23	47	40	29	37
Resistance ≥5 CLSI Subclasses[1]	4.5%	8.1%	7.3%	9.1%	7.2%	9.0%	9.0%	12.3%	10.3%	5.9%	11.4%
	5	64	64	41	30	34	19	38	31	18	24
At Least ACSSuT[2]	4.5%	7.8%	7.1%	8.6%	7.2%	7.7%	7.6%	12.0%	9.6%	5.3%	10.9%
	5	62	62	39	30	29	16	37	29	16	23
At Least ACT/S[3]	0.0%	0.5%	0.5%	0.0%	1.0%	0.5%	0.9%	0.6%	1.7%	0.3%	1.9%
	0	4	4	0	4	2	2	2	5	1	4
At Least ACSSuTAuCf[4]	0.0%	0.1%	0.6%	1.3%	2.2%	1.8%	1.9%	1.0%	2.7%	1.0%	0.5%
	0	1	5	6	9	7	4	3	8	3	1
At Least Ceftiofur and Nalidixic	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Acid Resistant	0	0	0	0	0	1	0	0	0	0	0

[1]CLSI: Clinical and Laboratory Standards Institute M100 Document
[2]ACSSuT: resistance to at least ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
[3]ACT/S: resistance to at least ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
[4]ACSSuTAuCf: resistance to at least ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

B. *Campylobacter*

Table 1B. *Campylobacter* Species Isolated from Chicken, 1998-2007[1]

Campylobacter Species	1998 (n=194)	1999 (n=731)	2000 (n=765)	2001 (n=116)	2002 (n=814)	2003 (n=621)	2004 (n=694)	2005 (n=947)	2006 (n=351)	2007 (n=242)
C. jejuni	66.0% 128	77.0% 563	72.1% 590	55.2% 64	64.6% 526	60.2% 374	73.2% 508	59.9% 567	65.0% 228	68.6% 166
C. coli	32.5% 63	23.0% 168	22.5% 172	44.8% 52	35.4% 288	39.8% 247	26.8% 186	40.1% 380	35.0% 123	31.4% 76
Other	1.5% 3	0.0% 0	0.4% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

[1] Differences in isolation methods are described in the section on methods

Figure 1B. *Campylobacter* Species Isolated from Chicken, 1998-2007

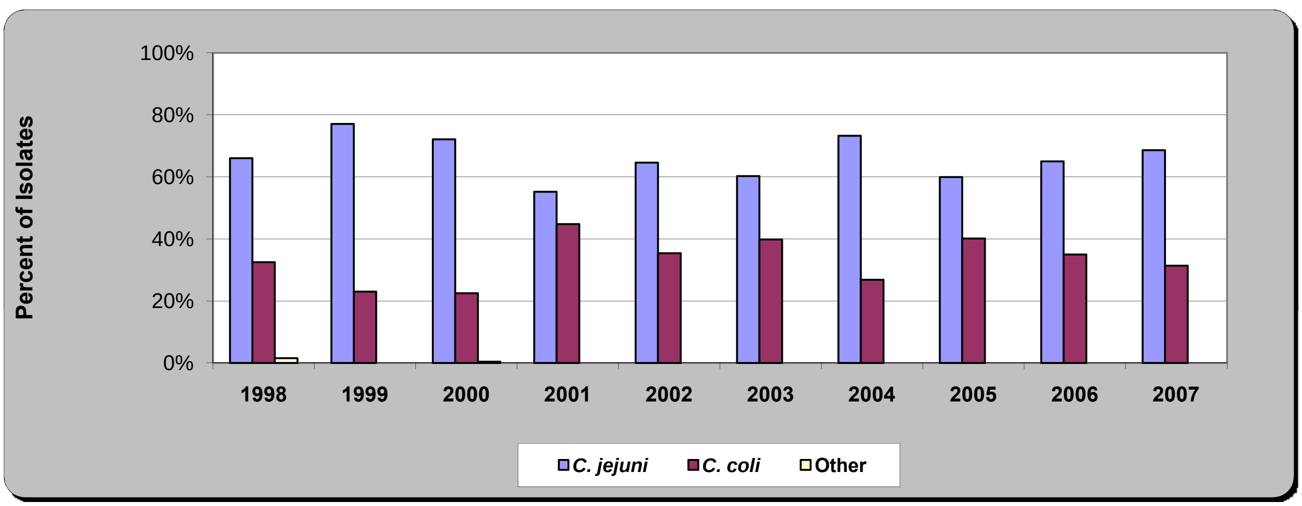

Table 2B. Distribution of MICs and Occurrence of Resistance among *Campylobacter* , 2007

Antimicrobial	Isolate Species (# of Isolates) C. coli (76) C. jejuni (166)	%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
Aminoglycosides																		
Gentamicin	*C. coli*	0.0	1.3	0.1-8.1				1.3	19.7	76.3	1.3						**1.3**	
	C. jejuni	0.0	0.0	0.0-2.8				4.2	37.3	58.4								
Lincosamides																		
Clindamycin	*C. coli*	3.9	9.2	4.1-18.6			3.9	22.4	57.9	1.3		1.3	3.9	**9.2**				
	C. jejuni	0.0	0.0	0.0-2.8		1.2	40.4	49.4	8.4	0.6								
Macrolides/Ketolides																		
Azithromycin	*C. coli*	0.0	14.5	7.8-24.9		13.2	50.0	22.4										**14.5**
	C. jejuni	0.0	0.0	0.0-2.8	11.4	51.8	33.1	3.0		0.6								
Erythromycin	*C. coli*	0.0	14.5	7.8-24.9				2.6	22.4	17.1	40.8	2.6						**14.5**
	C. jejuni	0.0	0.0	0.0-2.8			1.2	13.9	48.8	30.7	5.4							
Telithromycin	*C. coli*	1.3	13.2	6.9-23.4				2.6	19.7	6.6	25.0	31.6		1.3	**13.2**			
	C. jejuni	0.0	0.0	0.0-2.8				2.4	17.5	48.2	28.9	3.0						
Phenicols																		
Florfenicol	*C. coli*	0.0	0.0	0.0-6.0						6.6	86.8	6.6						
	C. jejuni	0.0	0.0	0.0-2.8				0.6	0.6	35.5	57.8	5.4						
Quinolones																		
Ciprofloxacin	*C. coli*	0.0	15.8	8.8-26.4			22.4	42.1	19.7				**1.3**	**7.9**	**6.6**			
	C. jejuni	0.0	21.7	15.8-28.9		0.6	48.8	24.1	3.6	0.6	0.6		**1.8**	**14.5**	**5.4**			
Nalidixic acid	*C. coli*	0.0	15.8	8.8-26.4									75.0	9.2			**5.3**	**10.5**
	C. jejuni	0.6	21.7	15.8-28.9									68.1	9.0	0.6	0.6	**5.4**	**16.3**
Tetracyclines																		
Tetracycline	*C. coli*	0.0	42.1	31.0-54.0				13.2	39.5	5.3						**1.3**	**6.6**	**34.2**
	C. jejuni	0.6	56.6	48.7-64.2			4.2	24.7	7.8	4.2	1.2	0.6		0.6	**4.8**	**12.7**	**19.3**	**19.9**

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction method

[4] 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 3B. Antimicrobial Resistance among *Campylobacter* from Chicken, 1998-2007[1,2]

Year			1998	1999	2000	2001[3]	2002	2003	2004	2005	2006	2007
Number of Isolates Tested		*C. coli*	63	168	172	52	288	247	186	380	123	76
		C. jejuni	128	563	590	64	526	374	508	567	228	166
Antimicrobial Class	**Antimicrobial**	**Isolate Species**										
Aminoglycosides	Gentamicin	*C. coli*	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0	1.3% 1
		C. jejuni	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Lincosamides	Clindamycin	*C. coli*	20.6% 13	12.5% 21	12.8% 22	3.8% 2	8.3% 24	8.9% 22	4.8% 9	2.4% 9	1.6% 2	9.2% 7
		C. jejuni	3.9% 5	0.5% 3	0.2% 1	0.0% 0	0.8% 4	1.1% 4	0.8% 4	0.4% 2	0.0% 0	0.0% 0
Macrolides/ Ketolides	Azithromycin	*C. coli*	25.4% 16	14.9% 25	22.7% 39	11.5% 6	19.4% 56	20.2% 50	9.1% 17	8.4% 32	8.9% 11	14.5% 11
		C. jejuni	3.1% 4	0.4% 2	0.7% 4	3.1% 2	1.0% 5	1.3% 5	1.6% 8	1.4% 8	0.4% 1	0.0% 0
	Erythromycin	*C. coli*	23.8% 15	14.9% 25	22.7% 39	11.5% 6	18.8% 54	20.2% 50	9.1% 17	8.4% 32	8.9% 11	14.5% 11
		C. jejuni	3.1% 4	0.2% 1	0.5% 3	3.1% 2	0.6% 3	1.6% 6	1.6% 8	1.1% 6	0.4% 1	0.0% 0
	Telithromycin	*C. coli*								5.5% 21	6.5% 8	13.2% 10
		C. jejuni								0.4% 2	0.0% 0	0.0% 0
Phenicols	Chloramphenicol	*C. coli*	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
		C. jejuni	0.0% 0	0.0% 0[4]	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
	Florfenicol	*C. coli*								0.0% 0	0.0% 0	0.0% 0
		C. jejuni								0.0% 0	0.0% 0	0.0% 0
Quinolones	Ciprofloxacin	*C. coli*	20.6% 13	13.7% 23	14.5% 25	19.2% 10	16.0% 46	20.2% 50	26.3% 49	22.1% 84	15.4% 19	15.8% 12
		C. jejuni	9.4% 12	9.6% 54	10.5% 62	20.3% 13	18.6% 98	14.7% 55	21.3% 108	15.0% 85	8.8% 20	21.7% 36
	Nalidixic acid	*C. coli*	31.7% 20	17.3% 29	16.3% 28	21.2% 11	18.1% 52	21.9% 54	28.0% 52	22.1% 84	15.4% 19	15.8% 12
		C. jejuni	14.8% 19	11.9% 67	12.2% 72	20.3% 13	22.8% 120	15.5% 58	21.7% 110	15.3% 87	8.8% 20	21.7% 36
Tetracyclines	Tetracycline	*C. coli*	61.9% 39	57.7% 97	57.6% 99	57.7% 30	49.0% 141	51.0% 126	48.4% 90	42.1% 160	53.7% 66	42.1% 32
		C. jejuni	58.6% 75	53.3% 300	52.9% 312	34.4% 22	44.7% 235	47.1% 176	41.1% 209	44.1% 250	56.1% 128	56.6% 94

[1]From 1998 through 2004, the Etest method was used for susceptibility testing while in 2005 testing was conducted using broth microdilution. For breakpoints, please refer to Table 2 in the sampling and testing methods section. Etest MICs were not rounded up prior to categorization.

[2] From 1998 through 2000, nalidixic acid susceptibility and cephalothin resistance were used as selection criteria for *Campylobacter*

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

[4] One isolate originally found to be chloramphenicol resistant was not reproducible upon further testing

Table 4B. MDR of *C. coli*, 1998-2007

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	63	168	172	52	288	247	186	380	123	76
Resistance Pattern										
No Resistance Detected	19.0% 12	33.3% 56	27.9% 48	30.8% 16	37.5% 108	32.8% 81	37.1% 69	47.6% 181	39.0% 48	43.4% 33
Resistance $\geq$1 CLSI Subclass[1]	81.0% 51	66.7% 112	72.1% 124	69.2% 36	62.5% 180	67.2% 166	62.9% 117	52.4% 199	61.0% 75	56.6% 43
Resistance $\geq$2 CLSI Subclasses[1]	47.6% 30	26.2% 44	29.7% 51	26.9% 14	27.4% 79	32.4% 80	32.3% 60	29.2% 111	22.8% 28	26.3% 20
Resistance $\geq$3 CLSI Subclasses[1]	30.2% 19	17.3% 29	18.6% 32	15.4% 8	13.9% 40	18.6% 46	18.3% 34	17.9% 68	16.3% 20	18.4% 14
Resistance $\geq$4 CLSI Subclasses[1]	1.6% 1	4.8% 8	3.5% 6	1.9% 1	4.9% 14	3.6% 9	2.7% 5	2.6% 10	1.6% 2	5.3% 4
Resistance $\geq$5 CLSI Subclasses[1]	0.0% 0	1.8% 3	0.0% 0	0.0% 0	2.1% 6	0.4% 1	0.5% 1	0.3% 1	0.0% 0	3.9% 3

[1]CLSI: Clinical and Laboratory Standards Institute M100 Document

Table 5B. MDR of *C. jejuni*, 1998-2007

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	128	563	590	64	526	374	508	567	228	166
Resistance Pattern										
No Resistance Detected	38.3% 49	42.6% 240	42.2% 249	53.1% 34	44.9% 236	45.5% 170	48.2% 245	46.9% 266	39.9% 91	34.3% 57
Resistance $\geq$1 CLSI Subclass[1]	61.7% 79	57.4% 323	57.8% 341	46.9% 30	55.1% 290	54.5% 204	51.8% 263	53.1% 301	60.1% 137	65.7% 109
Resistance $\geq$2 CLSI Subclasses[1]	14.8% 19	11.5% 65	11.9% 70	21.9% 14	21.3% 112	16.0% 60	22.0% 112	16.0% 91	8.8% 20	21.7% 36
Resistance $\geq$3 CLSI Subclasses[1]	9.4% 12	6.9% 39	6.6% 39	9.4% 6	11.4% 60	8.8% 33	12.2% 62	6.2% 35	5.3% 12	12.7% 21
Resistance $\geq$4 CLSI Subclasses[1]	2.3% 3	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.0% 0	0.4% 2	0.2% 1	0.0% 0	0.0% 0
Resistance $\geq$5 CLSI Subclasses[1]	1.6% 2	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

[1]CLSI: Clinical and Laboratory Standards Institute M100 Document

C. *Escherichia coli*

Table 1C. Number of *E. coli* Isolated from Chicken, 2000-2007

Animal Source	Year							
	2000	2001	2002	2003	2004	2005	2006	2007
Chicken	285	1989	2100	1365	1697	2232	1357	1510

Table 2C. Distribution of MICs and Occurrence of Resistance among *E. coli*, 2007

Antimicrobial	%I[1]	%R[2]	95% CI[3]	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml)[4]																
Aminoglycosides																				
Amikacin	0.0	**0.0**	0.0-0.3						1.7	32.3	54.8	10.1	1.1							
Gentamicin	6.7	**38.0**	35.6-40.5					9.0	37.5	5.8	1.1	1.9	6.7	**16.9**	**21.1**					
Kanamycin	1.7	**7.7**	6.4-9.2										81.9	8.7	1.7	**0.6**	**7.2**			
Streptomycin	N/A	**47.0**	44.5-49.6												53.0	**24.2**	**22.8**			
Aminopenicillins																				
Ampicillin	0.1	**18.7**	16.8-20.8							20.1	43.0	17.9	0.3	0.1	**0.8**	**17.9**				
β-Lactam/β-Lactamase Inhibitor Combinations																				
Amoxicillin-Clavulanic Acid	0.5	**11.2**	9.7-12.9							6.0	38.1	35.8	8.5	0.5	**9.2**	**2.0**				
Cephalosporins																				
Ceftiofur	2.6	**7.0**	5.8-8.4				8.5	49.1	30.0	1.7	1.0	2.6	**5.4**	**1.6**						
Ceftriaxone	2.6	**0.1**	0-0.5					88.1	0.5	0.7	0.3	2.1	5.6	2.5	0.1	**0.0**	**0.1**			
Cephamycins																				
Cefoxitin	1.9	**10.3**	8.8-12.0						0.1	2.4	25.1	46.9	13.4	1.9	**6.5**	**3.8**				
Folate Pathway Inhibitors																				
Sulfonamides	N/A	**53.2**	50.6-55.7											42.0	4.0	0.1	0.2	0.4	**53.2**	
Trimethoprim-Sulfamethoxazole	N/A	**7.9**	6.6-9.4				63.7	17.4	5.9	4.0	1.1	**0.1**	**7.9**							
Phenicols																				
Chloramphenicol	0.6	**2.3**	1.6-3.2								14.6	61.5	21.0	0.6	**0.2**	**2.1**				
Quinolones																				
Ciprofloxacin	0.0	**0.1**	0-0.5	90.6	5.1	0.2	2.1	1.7	0.3	0.0	0.0	**0.0**	**0.1**							
Nalidixic Acid	N/A	**4.2**	3.3-5.4						2.5	26.0	55.4	11.5	0.3	0.1	**0.9**	**3.3**				
Tetracyclines																				
Tetracycline	1.8	**40.2**	37.7-42.7									58.0	1.8	**6.0**	**17.2**	**17.0**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction 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 area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 3C. Antimicrobial Resistance among *E. coli* , 2000-2007

Year		**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Number of Isolates Tested		285	1989	2100	1365	1697	2232	1357	1510
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**								
Aminoglycosides	Amikacin	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		0	0	0	0	0	0	0	0
	Gentamicin	40.0%	33.4%	38.0%	38.8%	39.1%	36.7%	33.1%	38.0%
		114	664	799	530	663	819	449	574
	Kanamycin	16.1%	14.5%	11.6%	10.3%	11.5%	10.3%	9.1%	7.7%
		46	288	243	140	196	231	123	117
	Streptomycin	77.5%	65.8%	65.1%	64.2%	64.1%	58.0%	49.5%	47.0%
		221	1308	1368	877	1088	1295	672	710
Aminopenicillins	Ampicillin	20.0%	19.5%	19.0%	18.6%	17.6%	22.0%	25.6%	18.7%
		57	388	399	254	298	492	347	282
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	8.1%	10.0%	10.9%	11.1%	8.8%	10.6%	16.0%	11.2%
		23	199	229	151	149	236	217	169
Cephalosporins	Ceftiofur	6.3%	4.4%	5.5%	7.1%	4.9%	6.5%	10.2%	7.0%
		18	88	115	97	83	145	139	106
	Ceftriaxone	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%
		0	0	1	0	1	1	1	1
Cephalosporins	Cephalothin	17.9%	12.9%	15.1%	16.6%				
		51	256	317	226				
Cephamycins	Cefoxitin	7.4%	8.7%	8.5%	8.3%	8.2%	9.9%	15.0%	10.3%
		21	173	178	113	139	221	204	155
Folate Pathway Inhibitors	Sulfonamides	57.9%	58.2%	46.1%	43.9%	53.2%	51.9%	48.6%	53.2%
		165	1157	969	599	903	1159	660	804
	Trimethoprim-Sulfamethoxazole	17.2%	12.6%	10.4%	10.5%	10.7%	10.4%	8.4%	7.9%
		49	251	218	144	181	232	114	120
Phenicols	Chloramphenicol	4.6%	2.4%	1.8%	1.3%	1.0%	1.0%	1.9%	2.3%
		13	47	38	18	17	22	26	34
Quinolones	Ciprofloxacin	0.0%	0.2%	0.0%	0.1%	0.2%	0.4%	0.0%	0.1%
		0	3	1	1	3	8	0	1
	Nalidixic Acid	10.2%	8.4%	6.8%	6.2%	6.8%	7.5%	5.4%	4.2%
		29	168	142	84	115	168	73	64
Tetracyclines	Tetracycline	68.4%	61.6%	58.6%	52.2%	50.3%	48.9%	49.0%	40.2%
		195	1226	1231	713	853	1092	665	607

Table 4C. MDR of *E. coli* , 2000-2007

Year	2000	2001	2002	2003	2004	2005	2006	2007
Number of Isolates Tested	285	1989	2100	1365	1697	2232	1357	1510
Resistance Pattern								
No Resistance Detected	10.2%	12.9%	15.9%	16.0%	17.0%	17.7%	18.6%	24.4%
	29	257	333	219	288	395	253	368
Resistance ≥1 CLSI Subclass[1]	89.8%	87.1%	84.1%	84.0%	83.0%	82.3%	81.4%	75.6%
	256	1732	1767	1146	1409	1837	1104	1142
Resistance ≥2 CLSI Subclasses[1]	76.8%	21.7%	68.0%	65.0%	66.5%	64.7%	62.9%	60.8%
	219	431	1428	887	1128	1444	854	918
Resistance ≥3 CLSI Subclasses[1]	55.1%	34.2%	43.3%	38.9%	42.3%	41.1%	42.9%	36.1%
	157	681	910	531	717	918	582	545
Resistance ≥4 CLSI Subclasses[1]	18.9%	7.9%	13.8%	13.0%	11.5%	14.7%	16.6%	12.6%
	54	157	289	177	195	327	225	191
Resistance ≥5 CLSI Subclasses[1]	7.7%	4.1%	6.6%	6.4%	4.8%	6.8%	7.3%	6.0%
	22	81	138	88	82	151	99	90

[1]CLSI: Clinical and Laboratory Standards Institute M100 Document