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Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

– PRELIMINARY RESULTS –

2008

... working towards the preservation of effective antimicrobials for humans and animals...

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Preamble

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is pleased to present its preliminary antimicrobial resistance (AMR) findings and recovery rates for the 2008 calendar year. These preliminary results have been generated using all 2008 data available as of June 2009. Additional isolates might be included in the full 2008 report. This document contains data from the following program components:

- *Surveillance of Human Clinical Isolates*
- *Farm Surveillance*
- *Abattoir Surveillance*
- *Retail Meat Surveillance*
- *Surveillance of Animal Clinical Isolates*

What's New in 2008 CIPARS Surveillance

Changes to CIPARS sampling design and report contents

- *Retail Meat Surveillance* began in the Maritimes provinces (New Brunswick, Prince Edward Island, and Nova Scotia) in September 2008.

Changes in Methods

- No changes in methods occurred in 2008.

Important Notes

- Antimicrobials were categorized on the basis of their importance in human medicine as outlined by the Veterinary Drugs Directorate of Health Canada, based on Version – November 30, 2006[1]. Antimicrobials are listed according to this categorization and then alphabetically.

About CIPARS Surveillance Components

Surveillance of Human Clinical Isolates

The objective of this component is to provide representative AMR data on *Salmonella* isolates at the provincial level. All human *Salmonella* isolates received by the Provincial Public Health Laboratories (PPHLs) in Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador were forwarded to the National Microbiology Laboratory (NML). The PPHLs from more populated provinces (British Columbia, Alberta, Ontario, and Québec) forwarded isolates received from the 1st to the 15th of each month. In addition, in 2008, all human isolates of *S.* Newport and *S.* Typhi were forwarded to the NML because of concerns regarding multidrug resistance and their clinical importance, respectively.

[1] http://www.hc-sc.gc.ca/dhp-mps/consultation/vet/consultations/amr_ram_hum-med-eng.php. Accessed on August 26th, 2009

Farm Surveillance (pigs)

CIPARS *Farm Surveillance* was implemented in 2006 in swine herds across the 5 major pork-producing provinces (Alberta, Saskatchewan, Manitoba, Ontario, and Québec) in Canada. The primary objectives of this surveillance component are to obtain prevalence estimates for AMR and antimicrobial use, to provide data for human health risk assessments and to examine associations between use and resistance. This surveillance component focused on grower-finisher pigs.

The bacteria of interest in pigs were *Salmonella*, generic *Escherichia coli*, and *Enterococcus* recovered from composite fecal samples taken at the grower-finisher units. Nationally, 29 veterinarians and 108 sentinel grower-finisher sites were enrolled. In each of the participating provinces, the number of CIPARS sentinel sites was proportional to the national total of grower-finisher units, other than in Alberta and Saskatchewan where additional herds were enrolled through provincial initiatives.

Abattoir Surveillance (beef cattle, chickens, and pigs)

The principal objective of *Abattoir Surveillance* is to provide nationally representative and annual AMR data for bacteria isolated from animals entering the food chain. The bacteria of interest were sampled from the caecal contents (not carcasses) of slaughtered food animals to avoid misinterpretation related to cross-contamination and to better reflect the AMR in bacteria that originated from the farm. Only animals raised in Canada were included in the sampling.

This component of surveillance began in September 2002 with sampling designed to target generic *Escherichia coli* and *Salmonella* from beef cattle, broiler chickens, and pigs. *Salmonella* isolation from beef cattle was discontinued in 2003 because of the low prevalence of *Salmonella* in that population. Further changes led to the inclusion of *Campylobacter* surveillance in beef cattle in September 2005.

Over 90% of all food-producing animals in Canada are slaughtered in federally inspected abattoirs annually. Forty-four federally inspected slaughter plants (6 beef cattle plants, 24 poultry plants, and 14 swine plants)[2] from across Canada participated in 2008. The sampling method used was designed with the expectation that, across Canada, 150 isolates of each targeted bacterial species would be recovered from each of the 3 animal species over a 12-month period to avoid any potential seasonal bias in bacteria prevalence and antimicrobial susceptibility. The exception was *Campylobacte*r isolated from beef cattle, for which it was estimated that 100 isolates would be recovered over the same period.

Retail Meat Surveillance (beef, chicken, and pork)

The objective of *Retail Meat Surveillance* is to provide provincial representative annual estimates of AMR in selected bacteria species recovered from retail meat. Retail sampling provides a measure of human exposure to antimicrobial resistant bacteria via undercooked meat consumption or cross-contamination with raw meat products. In 2008, we collected samples in British Columbia, Saskatchewan, Ontario, Québec, and the Maritimes. Although collected in those provinces, these meat samples could originate from animals raised in other provinces, or from outside of the country (beef and pork).

We are interested in bacterial isolates recovered from specific raw meat products commonly consumed by Canadians, which originated from the 3 animal species sampled in *Abattoir Surveillance*. These raw meat products consisted of beef (ground beef), chicken (legs or wings [skin on]), and pork (chops). For ground beef, only lean ground beef was sampled in the first year of surveillance (2003); however, in 2004, the scope was widened to include a systematic selection of extra lean, lean, medium, and regular ground beef. This change was made to ensure representation of the heterogeneity of ground beef with respect to its origins (e.g. domestic vs. imported beef or fed beef cattle vs. culled dairy cattle).

The bacteria of interest in chicken meat were *Salmonella,* generic *Escherichia coli, Campylobacter*, and *Enterococcus*. In pork and beef, only generic *E. coli* was cultured and further tested for AMR given the low

[2] May include a very small number of samples from dairy cattle, as a small number of plants slaughter both commodities, however veal is excluded.

prevalence of *Campylobacter* and *Salmonella* in these commodities at the retail level, as determined during the early phase of the program.

The sampling protocol involved continuous weekly sample submissions from randomly selected census divisions, weighted by population, in each of the participating provinces. Using prevalence estimates from the previous year, our sampling protocols are designed to yield approximately 100 isolates per commodity per province per year, plus 20% for lost or damaged samples. Though, as resources to expand our sampling capacity were not fully available, we only collected half of the number of the retail samples needed to reach the target of 100 isolates in the provinces of British Columbia and Saskatchewan. As well, surveillance in the Maritimes was only initiated in September 2008. The target number of isolates per commodity per province per year was therefore not always reached in these provinces.

Surveillance of Animal Clinical Isolates (cattle, chickens, pigs, turkeys, and horses)

The *Surveillance of Animal Clinical Isolates* is based on samples collected by veterinarians and/or producers for diagnostic purposes. These *Salmonella* isolates were sent by provincial animal health laboratories from across the country to the *Salmonella* Typing Laboratory (STL) at the Laboratory for Foodborne Zoonoses (LFZ), Guelph, Ontario, where they were serotyped, susceptibility tested, and in some cases, phagetyped. Isolates from Québec were serotyped by the Réseau des laboratoires de l'Institut national de santé animale du Québec before being shipped to the STL where they were phagetyped when appropriate, and tested for AMR.

Unlike the *Surveillance of Human Clinical Isolates* component, isolates received by provincial animal health laboratories may not all be forwarded to the LFZ, Guelph, with the exception of the provinces of Ontario and Québec. Therefore, coverage may have varied considerably across provinces.

Most samples are obtained from diseased animals[3] and sample submissions may have followed therapeutic failure. Generally, these animals do not enter the food chain, thus estimates of AMR from these isolates may be not appropriate to assess general human exposure to AMR arising from food-animals. However, information from these isolates is valuable for detecting emerging resistance, identifying new multidrug resistance patterns, and assessing the occurrence of resistance in sick animals.

[3] Environmental or fluff (chicken) samples taken for monitoring purposes are sometimes submitted as diagnostic samples.

Antimicrobial Resistance in Humans and the Agri-Food Sector

Humans

Salmonella

(Total n = 3600)

Salmonella Enteritidis

(n = 1259)

Table 1. Resistance to specific antimicrobials in *Salmonella* Enteritidis isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 212 n (%)	AB n = 147 n (%)	SK n = 58 n (%)	MB n = 85 n (%)	ON n = 412 n (%)	QC n = 221 n (%)	NB n = 39 n (%)	NS n = 41 n (%)	PEI n = 10 n (%)	NL n = 34 n (%)	Canada[a] %
	Amoxicillin-clavulanic acid	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
I	Ceftiofur	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
	Ceftriaxone	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Ampicillin	11 (5)	4 (3)	1 (2)	0 (0)	11 (3)	5 (2)	0 (0)	1 (2)	0 (0)	0 (0)	3
	Cefoxitin	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
	Gentamicin	0 (0)	1 (1)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
II	Kanamycin	0 (0)	1 (1)	0 (0)	0 (0)	1 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
	Nalidixic acid	23 (11)	22 (15)	8 (14)	12 (14)	56 (14)	25 (11)	6 (15)	4 (10)	0 (0)	2 (6)	13
	Streptomycin	3 (1)	1 (1)	0 (0)	0 (0)	5 (1)	1 (0)	0 (0)	1 (2)	0 (0)	0 (0)	< 1
	Trimethoprim-Sulfamethoxazole	0 (0)	1 (1)	0 (0)	0 (0)	1 (0)	2 (1)	1 (3)	0 (0)	0 (0)	0 (0)	< 1
	Chloramphenicol	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
III	Sulfisoxazole	2 (1)	2 (1)	0 (0)	0 (0)	4 (1)	2 (1)	1 (3)	1 (2)	0 (0)	0 (0)	< 1
	Tetracycline	3 (1)	5 (3)	0 (0)	0 (0)	6 (1)	3 (1)	1 (3)	1 (2)	0 (0)	1 (3)	2
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, or Nunavut.

[a] Estimated percentage for Canada corrected for non-proportional submission protocols among provinces (See Appendix A.2 in previous CIPARS Annual Report).

Salmonella Heidelberg

(n = 290)

Table 2. Resistance to specific antimicrobials in *Salmonella* Heidelberg isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 16 n (%)	AB n = 32 n (%)	SK n = 7 n (%)	MB n = 19 n (%)	ON n = 102 n (%)	QC n = 65 n (%)	NB n = 17 n (%)	NS n = 22 n (%)	PEI n = 5 n (%)	NL n = 5 n (%)	Canada[a] %
	Amoxicillin-clavulanic acid	2 (13)	7 (22)	0 (0)	2 (11)	14 (14)	8 (12)	4 (24)	1 (5)	0 (0)	1 (20)	14
I	Ceftiofur	3 (19)	8 (25)	0 (0)	2 (11)	14 (14)	8 (12)	4 (24)	1 (5)	0 (0)	1 (20)	15
	Ceftriaxone	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Ampicillin	5 (31)	11 (34)	0 (0)	3 (16)	36 (35)	28 (43)	6 (35)	2 (9)	0 (0)	1 (20)	34
	Cefoxitin	2 (13)	7 (22)	0 (0)	2 (11)	14 (14)	8 (12)	3 (18)	1 (5)	0 (0)	1 (20)	14
	Gentamicin	0 (0)	0 (0)	0 (0)	1 (5)	1 (1)	3 (5)	1 (6)	0 (0)	0 (0)	1 (20)	2
II	Kanamycin	1 (6)	2 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1
	Nalidixic acid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Streptomycin	0 (0)	5 (16)	0 (0)	1 (5)	7 (7)	6 (9)	1 (6)	0 (0)	0 (0)	0 (0)	8
	Trimethoprim-Sulfamethoxazole	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	2 (3)	0 (0)	1 (5)	0 (0)	0 (0)	1
	Chloramphenicol	0 (0)	1 (3)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
III	Sulfisoxazole	0 (0)	1 (3)	0 (0)	1 (5)	2 (2)	5 (8)	1 (6)	1 (5)	0 (0)	0 (0)	4
	Tetracycline	2 (13)	6 (19)	0 (0)	1 (5)	4 (4)	2 (3)	1 (6)	1 (5)	1 (20)	0 (0)	6
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, or Nunavut.

[a] Estimated percentage for Canada corrected for non-proportional submission protocols among provinces (See Appendix A.2 in previous CIPARS Annual Report).

Salmonella Newport

(n = 177)

Table 3. Resistance to specific antimicrobials in *Salmonella* Newport isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 18 n (%)	AB n = 28 n (%)	SK n = 8 n (%)	MB n = 6 n (%)	ON n = 74 n (%)	QC n = 37 n (%)	NB n = 3 n (%)	NS n = 2 n (%)	PEI n = 0 n (%)	NL n = 1 n (%)	Canada %
	Amoxicillin-clavulanic acid	0 (0)	1 (4)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	1
I	Ceftiofur	0 (0)	2 (7)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	2
	Ceftriaxone	0 (0)	1 (4)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	1
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	0
	Ampicillin	0 (0)	3 (11)	0 (0)	0 (0)	2 (3)	0 (0)	0 (0)	0 (0)		0 (0)	3
	Cefoxitin	0 (0)	1 (4)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	1
	Gentamicin	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	< 1
II	Kanamycin	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	< 1
	Nalidixic acid	0 (0)	0 (0)	1 (13)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	< 1
	Streptomycin	0 (0)	2 (7)	0 (0)	0 (0)	2 (3)	0 (0)	0 (0)	0 (0)		0 (0)	2
	Trimethoprim-Sulfamethoxazole	0 (0)	0 (0)	0 (0)	0 (0)	2 (3)	0 (0)	0 (0)	0 (0)		0 (0)	1
	Chloramphenicol	0 (0)	2 (7)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)		0 (0)	2
III	Sulfisoxazole	0 (0)	2 (7)	0 (0)	0 (0)	3 (4)	0 (0)	0 (0)	0 (0)		0 (0)	3
	Tetracycline	0 (0)	3 (11)	0 (0)	0 (0)	4 (5)	0 (0)	0 (0)	0 (0)		0 (0)	4
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, Nunavut, or Prince Edward Island.

Salmonella Paratyphi A and Paratyphi B

(n = 65)

Table 4. Resistance to specific antimicrobials *Salmonella* Paratyphi A and B isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 19 n (%)	AB n = 4 n (%)	SK n = 1 n (%)	MB n = 5 n (%)	ON n = 24 n (%)	QC n = 11 n (%)	NB n = 0 n (%)	NS n = 1 n (%)	PEI n = 0 n (%)	NL n = 0 n (%)	Canada[a] %
	Amoxicillin-clavulanic acid	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	0 (0)		0 (0)			2
I	Ceftiofur	0 (0)	0 (0)	0 (0)	1 (20)	0 (0)	0 (0)		0 (0)			< 1
	Ceftriaxone	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)			0
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)			0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)			0
	Ampicillin	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	0 (0)		1 (100)			3
	Cefoxitin	0 (0)	0 (0)	0 (0)	1 (20)	0 (0)	0 (0)		0 (0)			< 1
	Gentamicin	0 (0)	0 (0)	0 (0)	1 (20)	0 (0)	0 (0)		0 (0)			< 1
II	Kanamycin	0 (0)	0 (0)	0 (0)	1 (20)	0 (0)	0 (0)		0 (0)			< 1
	Nalidixic acid	17 (89)	3 (75)	0 (0)	3 (60)	22 (92)	2 (18)		0 (0)			74
	Streptomycin	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	0 (0)		1 (100)			3
	Trimethoprim-Sulfamethoxazole	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)		0 (0)			2
	Chloramphenicol	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	0 (0)		1 (100)			3
III	Sulfisoxazole	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	0 (0)		1 (100)			3
	Tetracycline	0 (0)	0 (0)	0 (0)	1 (20)	1 (4)	1 (9)		1 (100)			5
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, Nunavut, New Brunswick, Prince Edward Island, or Newfoundland and Labrador. Humans are the only reservoir for *S.* Paratyphi A and *S.* Paratyphi B.

[a] Estimated percentage for Canada corrected for non-proportional submission protocols among provinces (See Appendix A.2 in previous CIPARS Annual Report).

Salmonella Typhi

(n = 186)

Table 5. Resistance to specific antimicrobials in *Salmonella* Typhi isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 49 n (%)	AB n = 17 n (%)	SK n = 1 n (%)	MB n = 4 n (%)	ON n = 97 n (%)	QC n = 18 n (%)	NB n = 0 n (%)	NS n = 0 n (%)	PEI n = 0 n (%)	NL n = 0 n (%)	Canada %
	Amoxicillin-clavulanic acid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
I	Ceftiofur	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
	Ceftriaxone	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
	Ampicillin	2 (4)	4 (24)	1 (100)	0 (0)	18 (19)	6 (33)					17
	Cefoxitin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
	Gentamicin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)					0
II	Kanamycin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)					< 1
	Nalidixic acid	34 (69)	14 (82)	1 (100)	3 (75)	67 (69)	10 (56)					69
	Streptomycin	2 (4)	4 (24)	1 (100)	0 (0)	20 (21)	6 (33)					18
	Trimethoprim-Sulfamethoxazole	2 (4)	3 (18)	1 (100)	0 (0)	20 (21)	6 (33)					17
	Chloramphenicol	2 (4)	3 (18)	1 (100)	0 (0)	21 (22)	6 (33)					18
III	Sulfisoxazole	2 (4)	4 (24)	1 (100)	0 (0)	21 (22)	6 (33)					18
	Tetracycline	2 (4)	3 (18)	1 (100)	0 (0)	4 (4)	1 (6)					6
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, Nunavut, New Brunswick, Nova Scotia, Prince Edward Island, or Newfoundland and Labrador.

Salmonella Typhimurium

(n = 471)

Table 6. Resistance to specific antimicrobials in *Salmonella* Typhimurium isolates; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 37 n (%)	AB n = 58 n (%)	SK n = 33 n (%)	MB n = 26 n (%)	ON n = 211 n (%)	QC n = 59 n (%)	NB n = 16 n (%)	NS n = 23 n (%)	PEI n = 2 n (%)	NL n = 6 n (%)	Canada[a] %
	Amoxicillin-clavulanic acid	1 (3)	0 (0)	1 (3)	3 (12)	6 (3)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	2
I	Ceftiofur	1 (3)	0 (0)	1 (3)	4 (15)	4 (2)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	2
	Ceftriaxone	0 (0)	0 (0)	0 (0)	2 (8)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	< 1
	Ciprofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Ampicillin	15 (41)	14 (24)	12 (36)	11 (42)	63 (30)	23 (39)	5 (31)	2 (9)	0 (0)	0 (0)	31
	Cefoxitin	1 (3)	1 (2)	1 (3)	3 (12)	4 (2)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	2
	Gentamicin	2 (5)	2 (3)	1 (3)	1 (4)	5 (2)	0 (0)	1 (6)	0 (0)	0 (0)	0 (0)	3
II	Kanamycin	9 (24)	13 (22)	2 (6)	3 (12)	18 (9)	8 (14)	4 (25)	1 (4)	0 (0)	1 (17)	13
	Nalidixic acid	2 (5)	3 (5)	0 (0)	1 (4)	2 (1)	1 (2)	1 (6)	0 (0)	0 (0)	0 (0)	2
	Streptomycin	14 (38)	21 (36)	13 (39)	9 (35)	65 (31)	18 (31)	4 (25)	0 (0)	0 (0)	0 (0)	31
	Trimethoprim-Sulfamethoxazole	5 (14)	2 (3)	0 (0)	3 (12)	7 (3)	5 (8)	2 (13)	2 (9)	0 (0)	0 (0)	5
	Chloramphenicol	9 (24)	8 (14)	11 (33)	3 (12)	54 (26)	13 (22)	2 (13)	0 (0)	0 (0)	0 (0)	22
III	Sulfisoxazole	17 (46)	22 (38)	13 (39)	9 (35)	67 (32)	19 (32)	6 (38)	3 (13)	0 (0)	0 (0)	34
	Tetracycline	19 (51)	13 (22)	14 (42)	8 (31)	63 (30)	24 (41)	6 (38)	3 (13)	0 (0)	2 (33)	32
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, or Nunavut.

[a] Estimated percentage for Canada corrected for non-proportional submission protocols among provinces (See Appendix A.2 in previous CIPARS Annual Report).

Other *Salmonella* serovars

(n = 1152)

Table 7. Resistance to specific antimicrobials in other *Salmonella* serovars; *Surveillance of Human Clinical Isolates*, 2008.

	Antimicrobial	BC n = 157 n (%)	AB n = 142 n (%)	SK n = 76 n (%)	MB n = 103 n (%)	ON n = 417 n (%)	QC n = 169 n (%)	NB n = 32 n (%)	NS n = 39 n (%)	PEI n = 5 n (%)	NL n = 12 n (%)	Canada[a] %
	Amoxicillin-clavulanic acid	3 (2)	2 (1)	1 (1)	2 (2)	5 (1)	4 (2)	1 (3)	1 (3)	0 (0)	0 (0)	2
I	Ceftiofur	3 (2)	2 (1)	1 (1)	2 (2)	5 (1)	4 (2)	1 (3)	2 (5)	0 (0)	1 (8)	2
	Ceftriaxone	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8)	< 1
	Ciprofloxacin	1 (1)	1 (1)	0 (0)	0 (0)	5 (1)	3 (2)	0 (0)	0 (0)	1 (20)	0 (0)	1
	Amikacin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Ampicillin	10 (6)	9 (6)	5 (7)	7 (7)	21 (5)	13 (8)	1 (3)	5 (13)	1 (20)	1 (8)	6
	Cefoxitin	3 (2)	2 (1)	2 (3)	5 (5)	5 (1)	4 (2)	1 (3)	1 (3)	0 (0)	0 (0)	2
	Gentamicin	3 (2)	2 (1)	1 (1)	3 (3)	11 (3)	3 (2)	0 (0)	3 (8)	1 (20)	1 (8)	2
II	Kanamycin	2 (1)	2 (1)	1 (1)	1 (1)	8 (2)	2 (1)	0 (0)	0 (0)	1 (20)	0 (0)	2
	Nalidixic acid	16 (10)	4 (3)	4 (5)	2 (2)	22 (5)	5 (3)	2 (6)	0 (0)	1 (20)	0 (0)	5
	Streptomycin	24 (15)	13 (9)	10 (13)	14 (14)	52 (12)	17 (10)	3 (9)	10 (26)	1 (20)	3 (25)	12
	Trimethoprim-Sulfamethoxazole	10 (6)	2 (1)	5 (7)	3 (3)	17 (4)	2 (1)	1 (3)	0 (0)	0 (0)	0 (0)	3
	Chloramphenicol	6 (4)	5 (4)	4 (5)	5 (5)	8 (2)	3 (2)	1 (3)	2 (5)	0 (0)	1 (8)	3
III	Sulfisoxazole	20 (13)	13 (9)	11 (14)	14 (14)	40 (10)	14 (8)	1 (3)	6 (15)	2 (40)	2 (17)	10
	Tetracycline	38 (24)	26 (18)	27 (36)	24 (23)	65 (16)	25 (15)	4 (13)	8 (21)	2 (40)	6 (50)	19
IV												

Roman numerals I to IV indicate the categories of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate. Province's names from left to right are: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland-Labrador. No *Salmonella* cases were reported in the Yukon, Northwest Territories, or Nunavut.

[a] Estimated percentage for Canada corrected for non-proportional submission protocols among provinces (See Appendix A.2 in previous CIPARS Annual Report).

Table 8. Number of antimicrobials in resistance patterns of *Salmonella* serovars; *Surveillance of Human Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
British Columbia					
Enteritidis	212 (41.7)	183	28	1	0
Typhi	49 (9.6)	13	34	2	0
Typhimurium	37 (7.3)	16	10	10	1
Newport	18 (3.5)	18	0	0	0
Paratyphi A	18 (3.5)	1	17	0	0
Heidelberg	16 (3.1)	10	6	0	0
I 4,[5],12:i:-	14 (2.8)	6	6	1	1
Stanley	11 (2.2)	6	4	0	1
Less common serovars	133 (26.2)	97	33	3	0
Total	**508 (100)**	**350**	**138**	**17**	**3**
Alberta					
Enteritidis	147 (34.3)	120	26	1	0
Typhimurium	58 (13.6)	34	12	12	0
Heidelberg	32 (7.5)	18	12	1	1
Newport	28 (6.5)	24	2	2	0
I 4,[5],12:i:-	18 (4.2)	11	7	0	0
Typhi	17 (4)	3	10	4	0
Infantis	14 (3.3)	14	0	0	0
Less common serovars	114 (26.6)	88	19	7	0
Total	**428 (100)**	**312**	**88**	**27**	**1**
Saskatchewan					
Enteritidis	58 (31.5)	50	8	0	0
Typhimurium	33 (17.9)	18	4	10	1
I 4,[5],12:i:-	18 (9.8)	11	6	0	1
Hadar	9 (4.9)	0	9	0	0
Newport	8 (4.3)	7	1	0	0
Heidelberg	7 (3.8)	7	0	0	0
Agona	6 (3.3)	1	5	0	0
Less common serovars	45 (24.5)	36	6	3	0
Total	**184 (100)**	**130**	**39**	**13**	**2**
Manitoba					
Enteritidis	85 (34.3)	73	12	0	0
Typhimurium	26 (10.5)	15	3	7	1
I 4,[5],12:i:-	24 (9.7)	17	7	0	0
Heidelberg	19 (7.7)	14	5	0	0
Agona	8 (3.2)	6	2	0	0
Newport	6 (2.4)	6	0	0	0
Kentucky	5 (2)	3	2	0	0
Thompson	5 (2)	5	0	0	0
Less common serovars	70 (28.2)	42	25	2	1
Total	**248 (100)**	**181**	**56**	**9**	**2**
Ontario					
Enteritidis	412 (30.8)	347	62	3	0
Typhimurium	211 (15.8)	136	19	54	2
Heidelberg	102 (7.6)	59	43	0	0
Typhi	97 (7.3)	25	54	18	0
Newport	74 (5.5)	70	2	1	1
Infantis	37 (2.8)	35	2	0	0
I 4,[5],12:i:-	28 (2.1)	19	8	1	0
Less common serovars	376 (28.1)	289	68	17	2
Total	**1337 (100)**	**980**	**258**	**94**	**5**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Table 8 (continued). Number of antimicrobials in resistance patterns of human *Salmonella* serovars; *Surveillance of Human Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Québec					
Enteritidis	221 (38.1)	193	28	0	0
Heidelberg	65 (11.2)	34	29	2	0
Typhimurium	59 (10.2)	30	15	13	1
Newport	37 (6.4)	37	0	0	0
Typhi	18 (3.1)	7	5	6	0
I 4,[5],12:i:-	16 (2.8)	9	6	1	0
Thompson	16 (2.8)	15	1	0	0
I 4,[5],12:b:-	12 (2.1)	12	0	0	0
Less common serovars	136 (23.4)	108	22	6	0
Total	**580 (100)**	**445**	**106**	**28**	**1**
New Brunswick					
Enteritidis	39 (36.4)	33	6	0	0
Heidelberg	17 (15.9)	11	5	1	0
Typhimurium	16 (15)	10	2	4	0
Agona	5 (4.7)	4	0	1	0
Hadar	3 (2.8)	0	3	0	0
Hartford	3 (2.8)	3	0	0	0
Newport	3 (2.8)	3	0	0	0
Oranienburg	3 (2.8)	3	0	0	0
Less common serovars	18 (16.8)	16	2	0	0
Total	**107 (100)**	**83**	**18**	**6**	**0**
Nova Scotia					
Enteritidis	41 (32)	37	3	1	0
Typhimurium	23 (18)	18	5	0	0
Heidelberg	22 (17.2)	19	3	0	0
Hadar	7 (5.5)	0	6	1	0
I 4,[5],12:i:-	3 (2.3)	2	1	0	0
Infantis	3 (2.3)	3	0	0	0
Poona	3 (2.3)	3	0	0	0
Less common serovars	26 (20.3)	22	1	3	0
Total	**128 (100)**	**104**	**19**	**5**	**0**
Prince Edward Island					
Enteritidis	10 (45.5)	10	0	0	0
Heidelberg	5 (22.7)	4	1	0	0
I 4,[5],12:b:-	2 (9.1)	2	0	0	0
Typhimurium	2 (9.1)	2	0	0	0
I 4,[5],12:i:-	1 (4.5)	0	1	0	0
Infantis	1 (4.5)	1	0	0	0
Kentucky	1 (4.5)	0	0	1	0
Total	**22 (100)**	**19**	**2**	**1**	**0**
Newfoundland and Labrador					
Enteritidis	34 (58.6)	31	3	0	0
Typhimurium	6 (10.3)	4	2	0	0
Heidelberg	5 (8.6)	3	2	0	0
Hadar	3 (5.2)	0	3	0	0
Agona	2 (3.4)	0	2	0	0
I 4,[5],12:i:-	2 (3.4)	1	0	1	0
Less common serovars	6 (10.3)	6	0	0	0
Total	**58 (100)**	**45**	**12**	**1**	**0**
Canada Total	**3600 (100)**	**2649**	**736**	**201**	**14**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Figure 1. Temporal variation of the resistance to selected antimicrobials in *S*. Enteritidis, *S*. Heidelberg, and *S*. Newport; *Surveillance of Human Clinical Isolates*, 2003–2008.

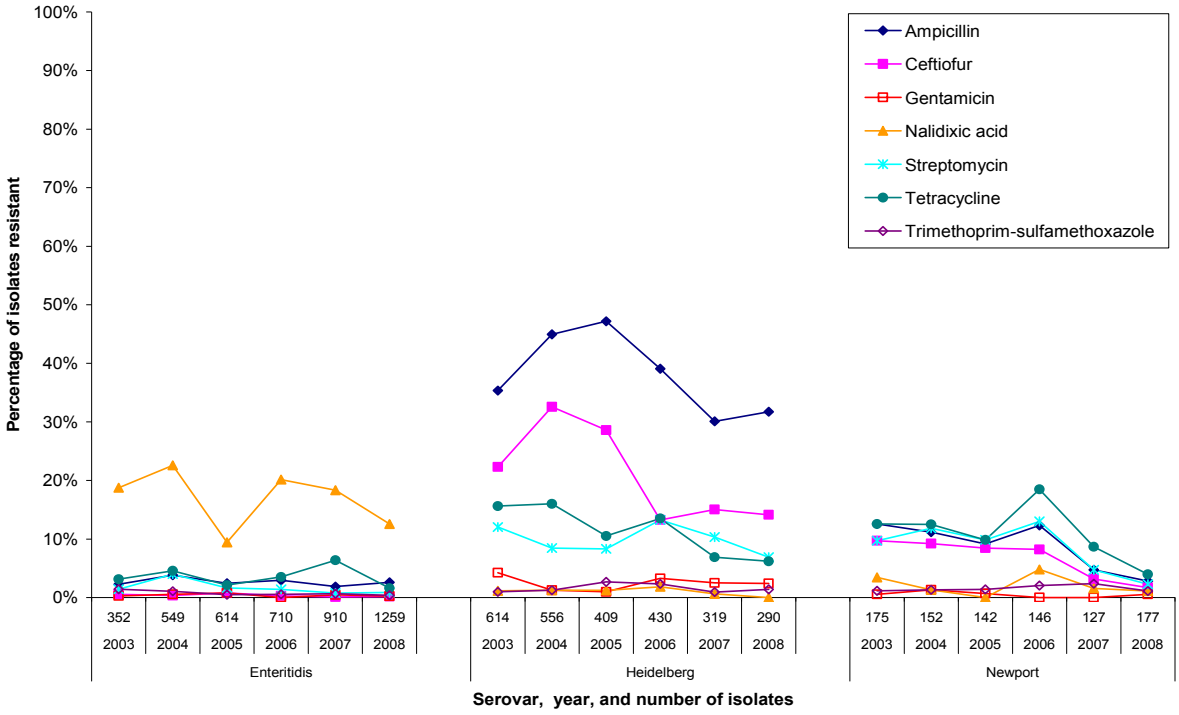
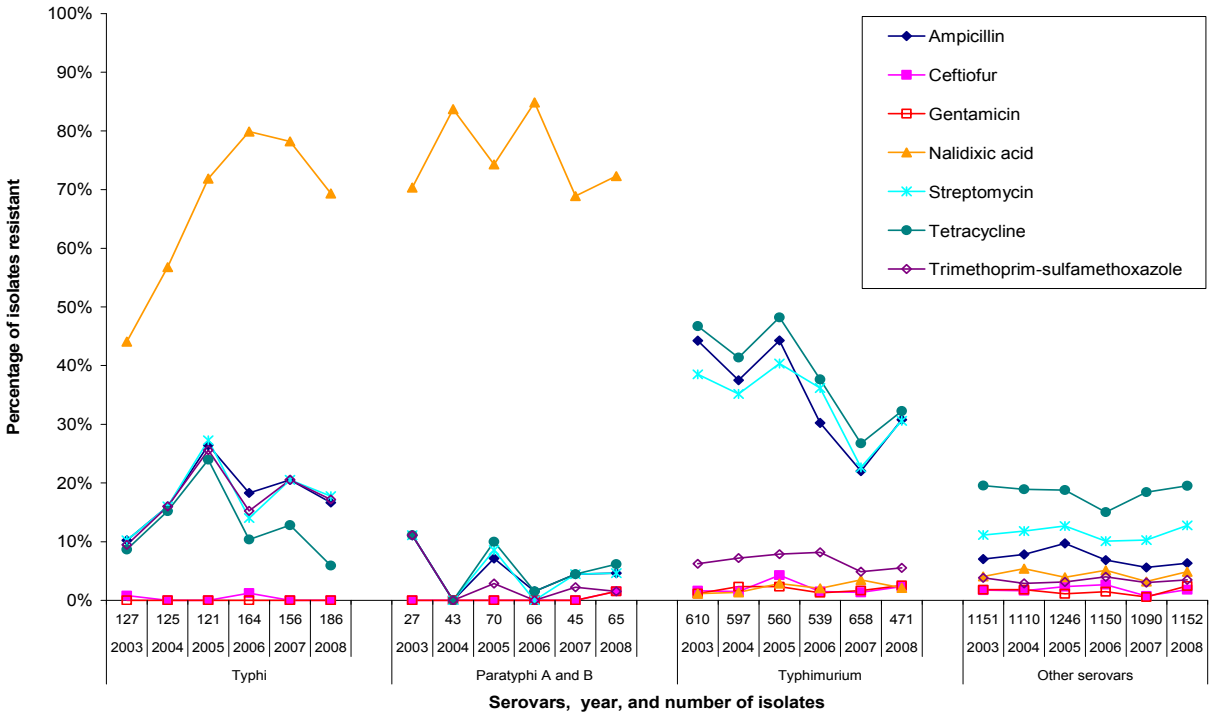


Figure 2. Temporal variation of the resistance to selected antimicrobials in *S*. Paratyphi A and B, *S*. Typhi, *S*. Typhimurium, and other *Salmonella* serovars ; *Surveillance of Human Clinical Isolates*, 2003–2008.



Cattle

Salmonella

Animal Clinical Isolates

(n = 133)

Figure 3. Resistance to specific antimicrobials in *Salmonella* isolates from cattle; *Surveillance of Animal Clinical Isolates*, 2008.

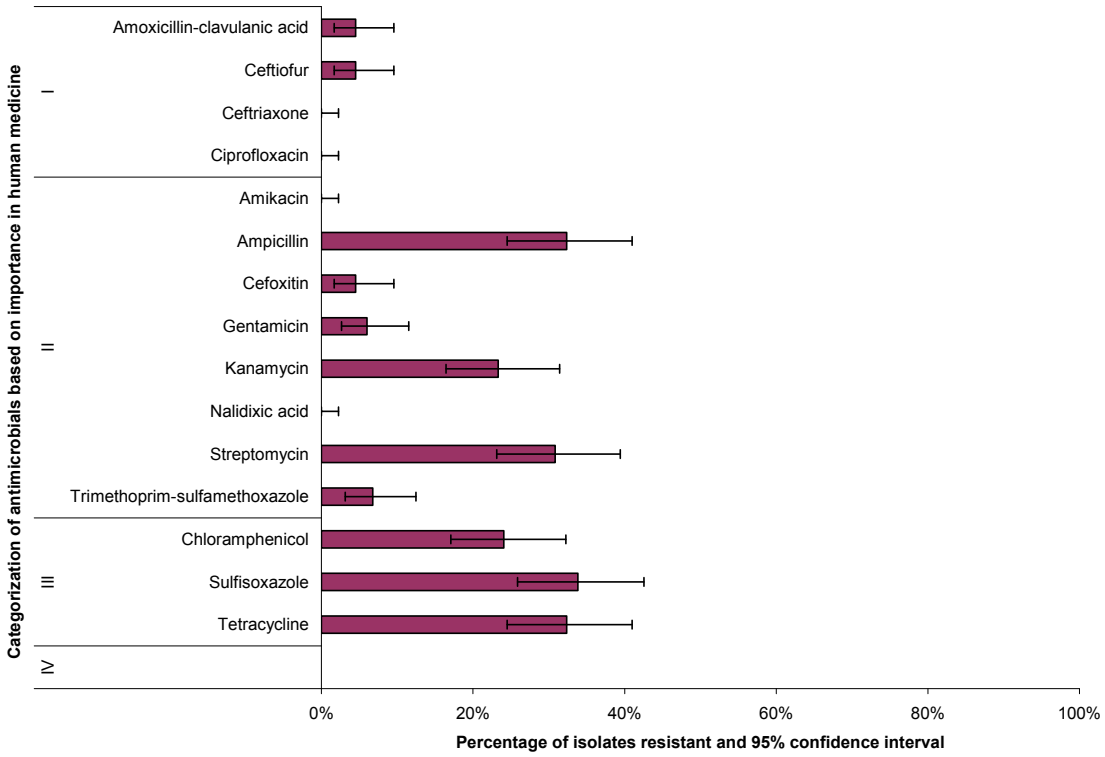


Table 9. Number of antimicrobials in resistance patterns of *Salmonella* serovars from cattle; *Surveillance of Animal Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Typhimurium	30 (22.6)	10	7	10	3
Typhimurium var. 5-	24 (18)	2	1	21	0
Kentucky	15 (11.3)	15	0	0	0
Cerro	13 (9.8)	13	0	0	0
I 6,14,18:-:-	10 (7.5)	10	0	0	0
Heidelberg	9 (6.8)	3	5	1	0
Muenster	8 (6)	8	0	0	0
Enteritidis	4 (3)	3	1	0	0
Thompson	4 (3)	4	0	0	0
Less common serovars	16 (12)	14	1	0	1
Total	**133 (100)**	**82**	**15**	**32**	**4**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Escherichia coli

Abattoir Surveillance

(n = 176)

Figure 4. Resistance to specific antimicrobials in *E. coli* isolates from beef cattle; *Abattoir Surveillance*, 2008.

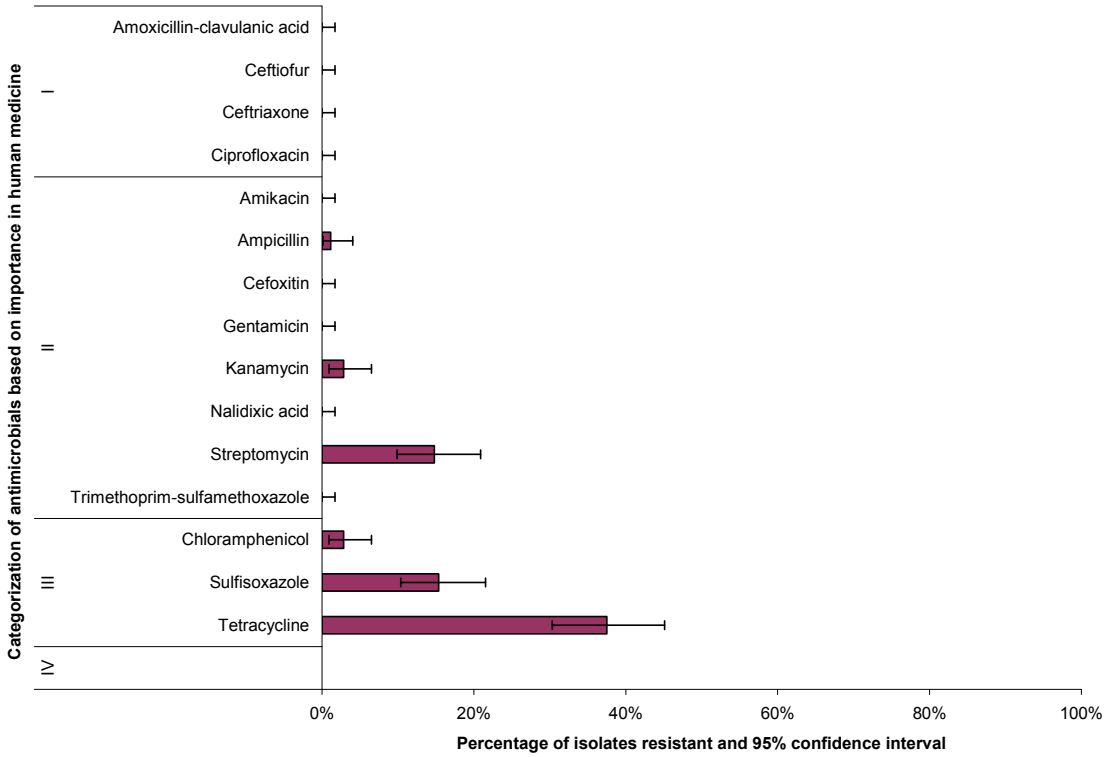
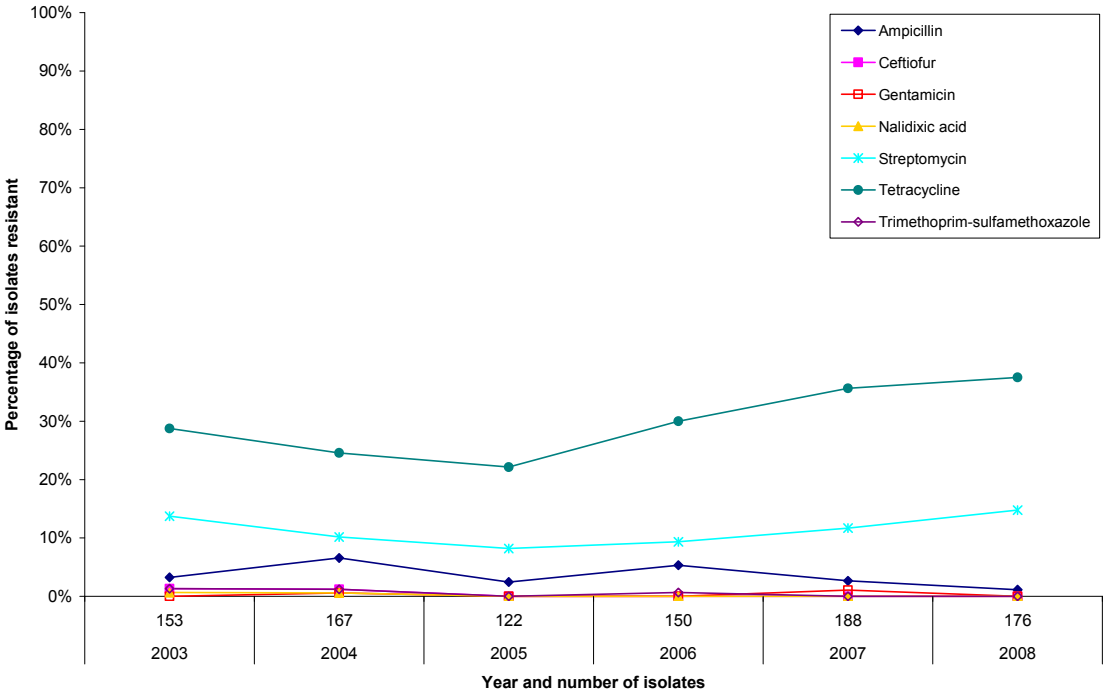


Figure 5. Temporal variation of the resistance to selected antimicrobials in *E.coli* isolates from beef cattle; *Abattoir Surveillance*, 2003–2008.



Retail Meat Surveillance

(n = 572)

Figure 6. Resistance to specific antimicrobials in *E. coli* isolates from beef; *Retail Meat Surveillance*, 2008.

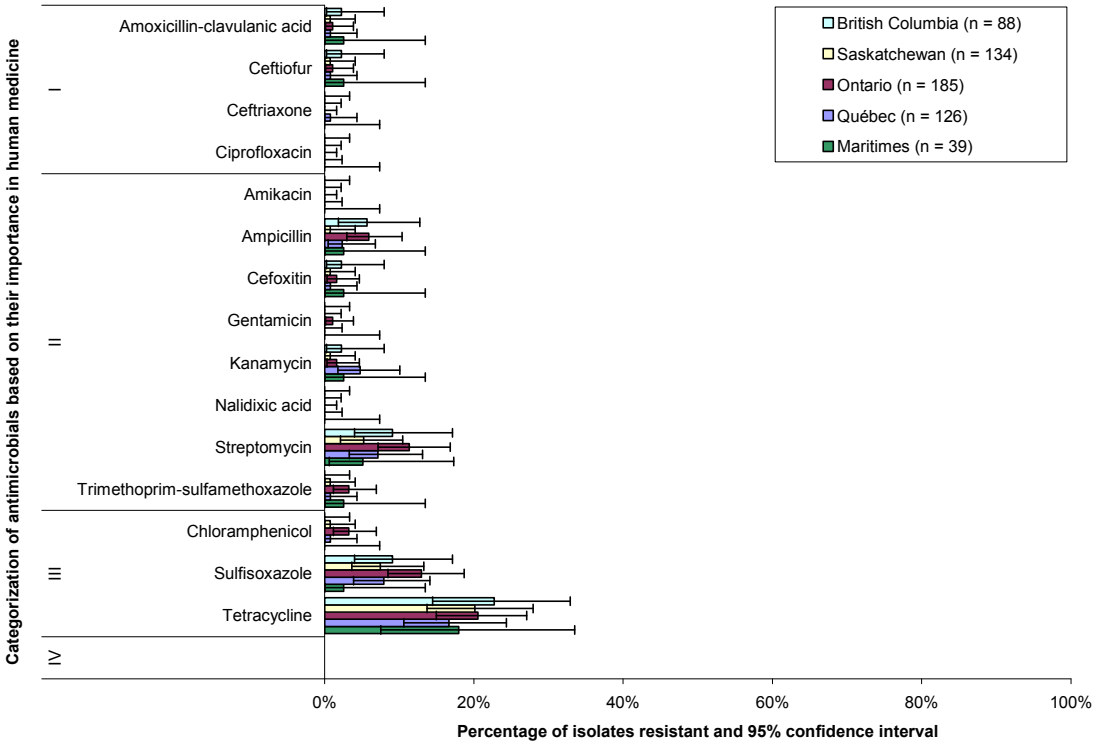
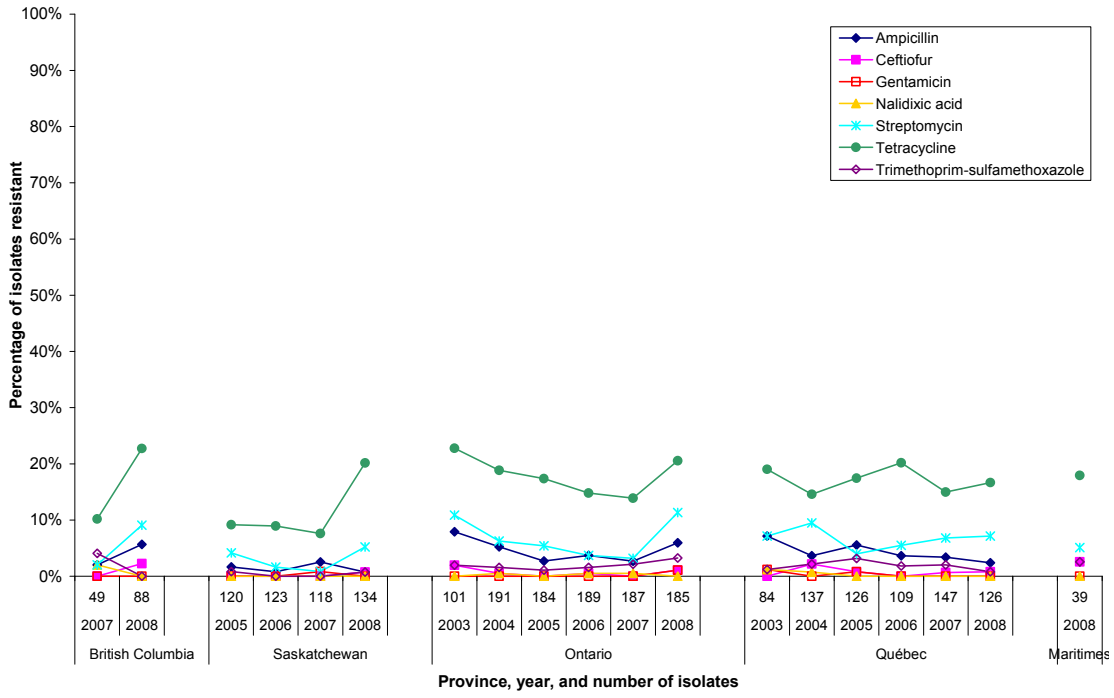


Figure 7. Temporal variation of the resistance to selected antimicrobials in *E. coli* isolates from beef; *Retail Meat Surveillance*, 2003–2008.

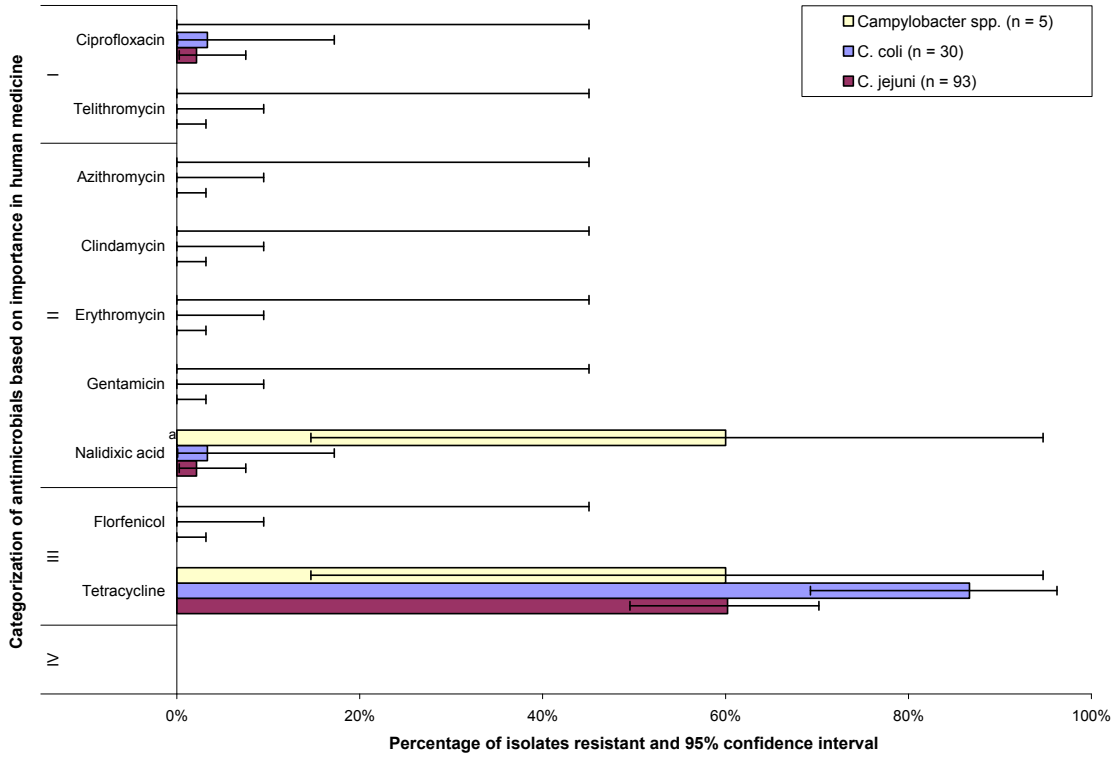


Campylobacter

Abattoir Surveillance

(n = 128)

Figure 8. Resistance to specific antimicrobials in *Campylobacter* species from beef cattle; *Abattoir Surveillance*, 2008.

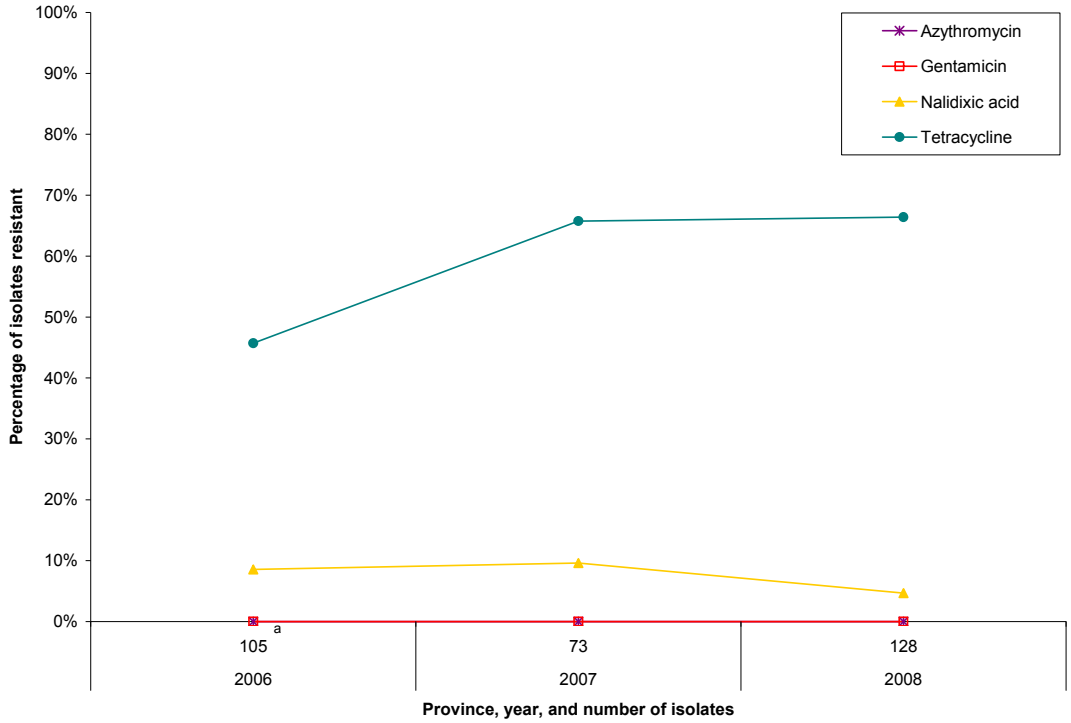


[a] *Campylobacter* spp. may include some species that are intrinsically resistant to nalidixic acid.

Table 10. Number of antimicrobials in resistance patterns of *Campylobacter* species from beef cattle; *Abattoir Surveillance*, 2008.

Species	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 2	3 - 4	5 - 9
		Number of isolates			
C. jejuni	93 (72.7)	37	56	0	0
C. coli	30 (23.4)	3	27	0	0
Campylobacter spp.	5 (3.9)	2	3	0	0
Total	**128 (100)**	**42**	**86**	**0**	**0**

Figure 9. Temporal variation of the resistance to selected antimicrobials in *Campylobacter* isolates from beef cattle; *Abattoir Surveillance*, 2005–2008.



[a] This number of isolates includes those from year 2005 (n = 23).

Chickens

Salmonella

Abattoir Surveillance

(n = 234)

Figure 10. Resistance to specific antimicrobials in *Salmonella* isolates from chickens; *Abattoir Surveillance*, 2008.

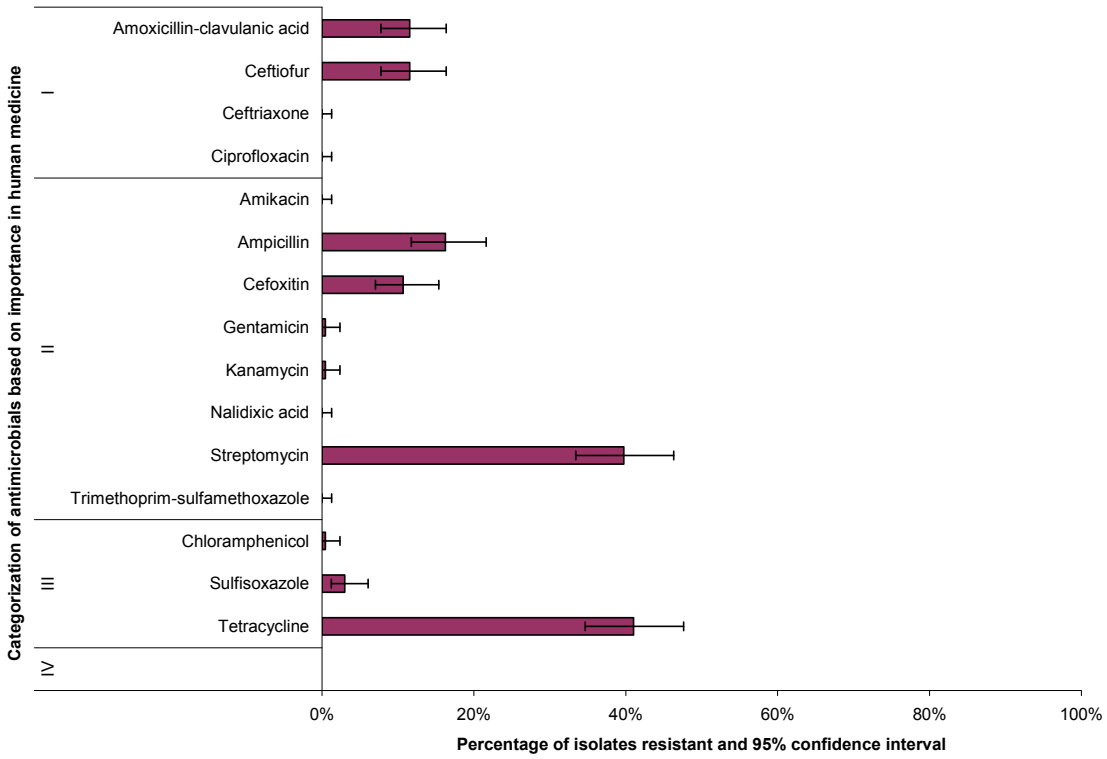
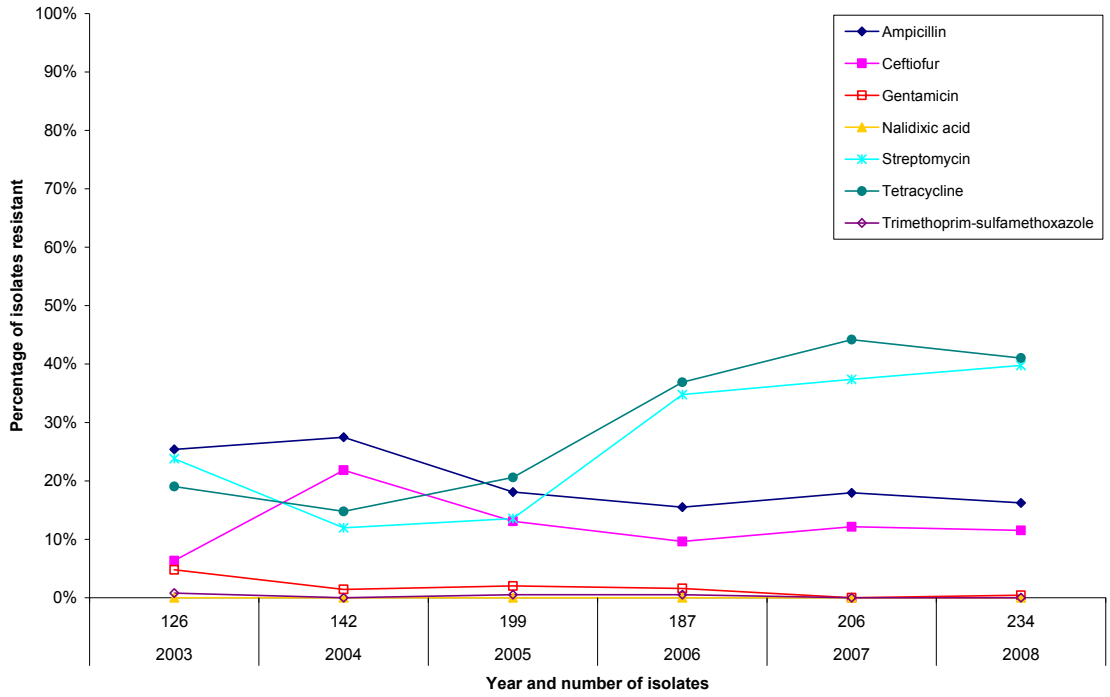


Table 11. Number of antimicrobials in resistance patterns of *Salmonella* serovars from chickens; *Abattoir Surveillance*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Kentucky	93 (39.7)	18	60	15	0
Enteritidis	45 (19.2)	45	0	0	0
Heidelberg	33 (14.1)	19	14	0	0
Hadar	13 (5.6)	0	13	0	0
Typhimurium	7 (3)	5	1	1	0
Mbandaka	5 (2.1)	5	0	0	0
Rissen	5 (2.1)	1	4	0	0
Less common serovars	33 (14.1)	20	13	0	0
Total	**234 (100)**	**113**	**105**	**16**	**0**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Figure 11. Temporal variation of the resistance to selected antimicrobials in *Salmonella* isolates from chickens; *Abattoir Surveillance*, 2003–2008.



Retail Meat Surveillance

(n = 382)

Figure 12. Resistance to specific antimicrobials in *Salmonella* isolates from chicken; *Retail Meat Surveillance*, 2008.

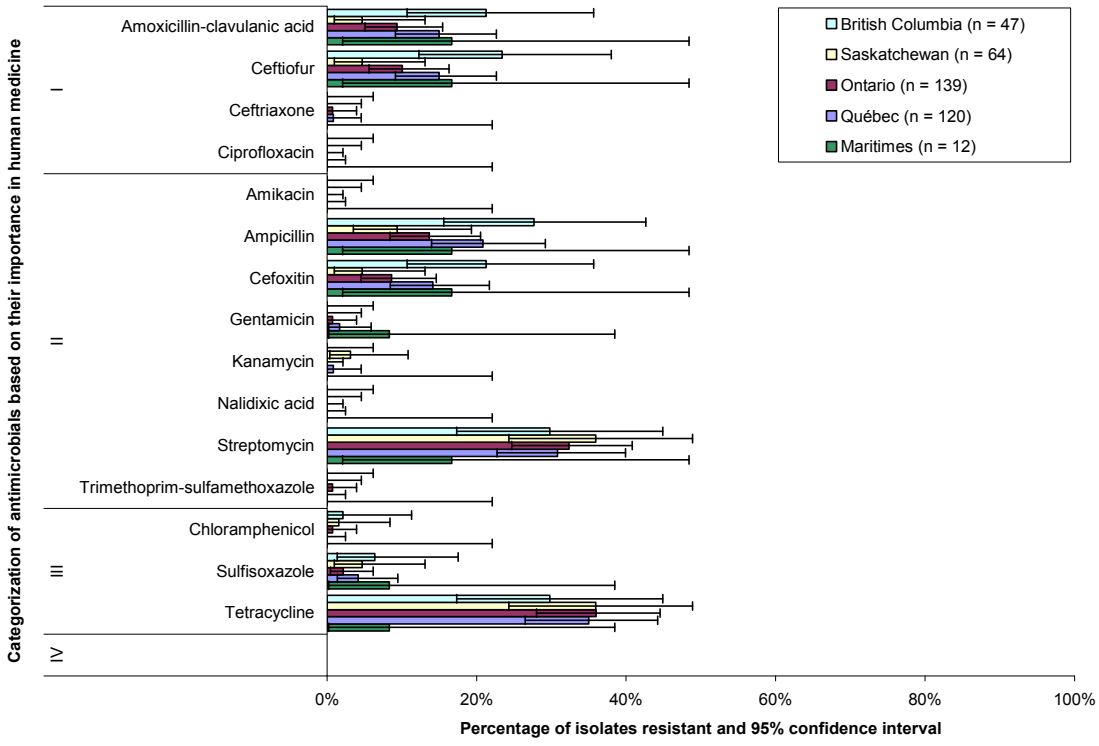
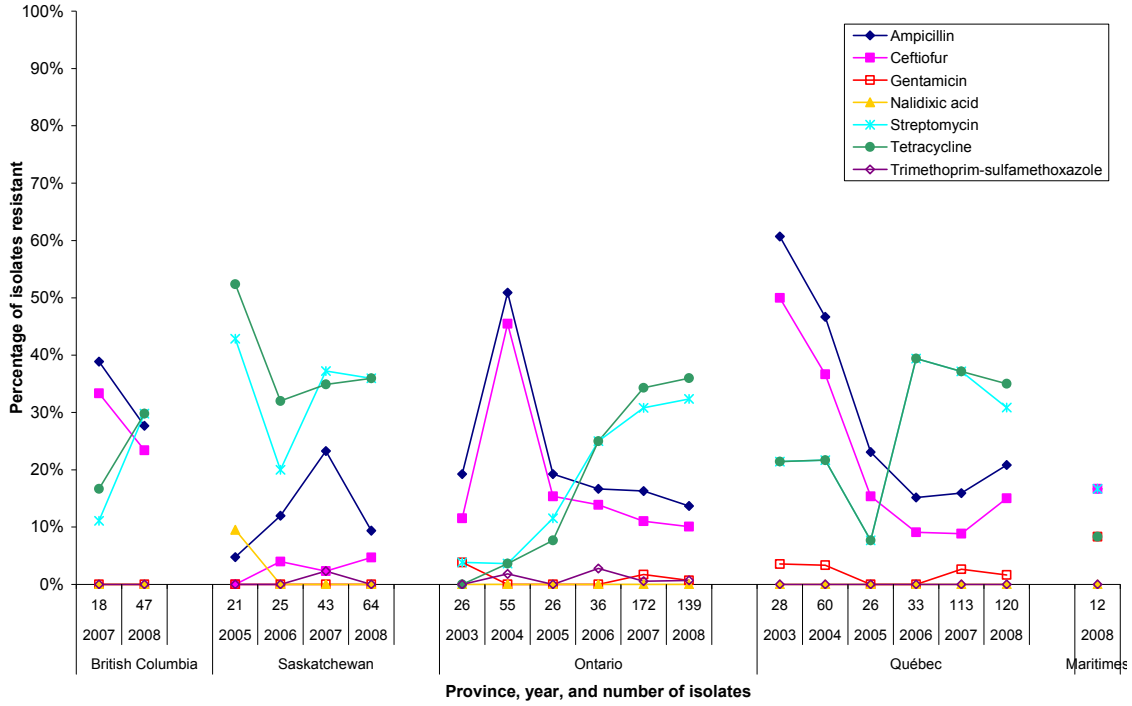


Table 12. Number of antimicrobials in resistance patterns of *Salmonella* serovars from chicken; *Retail Meat Surveillance*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
British Columbia					
Enteritidis	14 (29.8)	14	0	0	0
Kentucky	13 (27.7)	1	6	6	0
Hadar	3 (6.4)	1	2	0	0
Heidelberg	3 (6.4)	0	2	1	0
Mbandaka	3 (6.4)	3	0	0	0
Typhimurium	3 (6.4)	2	0	1	0
I 4,[5],12:i:-	2 (4.3)	1	0	1	0
Senftenberg	2 (4.3)	2	0	0	0
Meleagridis	1 (2.1)	1	0	0	0
Rissen	1 (2.1)	1	0	0	0
Schwarzengrund	1 (2.1)	1	0	0	0
Thompson	1 (2.1)	1	0	0	0
Total	**47 (100)**	**28**	**10**	**9**	**0**
Saskatchewan					
Kentucky	15 (23.4)	3	12	0	0
Enteritidis	14 (21.9)	14	0	0	0
Heidelberg	12 (18.8)	7	5	0	0
I 4,[5],12:i:-	7 (10.9)	6	1	0	0
Hadar	6 (9.4)	0	6	0	0
Infantis	3 (4.7)	2	1	0	0
Mbandaka	2 (3.1)	1	1	0	0
Less common serovars	5 (7.8)	3	1	1	0
Total	**64 (100)**	**36**	**27**	**1**	**0**
Ontario					
Kentucky	46 (33.1)	10	33	3	0
Enteritidis	22 (15.8)	22	0	0	0
Heidelberg	21 (15.1)	17	4	0	0
Hadar	11 (7.9)	0	11	0	0
Kiambu	7 (5)	2	2	3	0
Thompson	7 (5)	6	1	0	0
Typhimurium	6 (4.3)	6	0	0	0
Schwarzengrund	4 (2.9)	2	2	0	0
Infantis	3 (2.2)	3	0	0	0
Less common serovars	12 (8.6)	6	5	1	0
Total	**139 (100)**	**74**	**58**	**7**	**0**
Québec					
Kentucky	44 (36.7)	6	32	6	0
Heidelberg	38 (31.7)	22	16	0	0
Enteritidis	11 (9.2)	11	0	0	0
Thompson	6 (5)	6	0	0	0
Kiambu	5 (4.2)	1	4	0	0
I 6,7:-:1,5	3 (2.5)	3	0	0	0
Schwarzengrund	3 (2.5)	1	2	0	0
Less common serovars	10 (8.3)	5	4	1	0
Total	**120 (100)**	**55**	**58**	**7**	**0**
Maritimes					
Heidelberg	4 (33.3)	3	1	0	0
Thompson	3 (25)	3	0	0	0
Kentucky	2 (16.7)	1	1	0	0
Enteritidis	1 (8.3)	1	0	0	0
I 4,[5],12:-:-	1 (8.3)	0	0	1	0
I 6,7:k:-	1 (8.3)	1	0	0	0
Total	**12 (100)**	**9**	**2**	**1**	**0**
Canada Total	**382 (100)**	**202**	**155**	**25**	**0**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Figure 13. Temporal variation of the resistance to selected antimicrobials in *Salmonella* isolates from chicken; *Retail Meat Surveillance*, 2003–2008.



Animal Clinical Isolates

(n = 208)

Figure 14. Resistance to specific antimicrobials in *Salmonella* isolates from chickens; *Surveillance of Animal Clinical Isolates*, 2008.

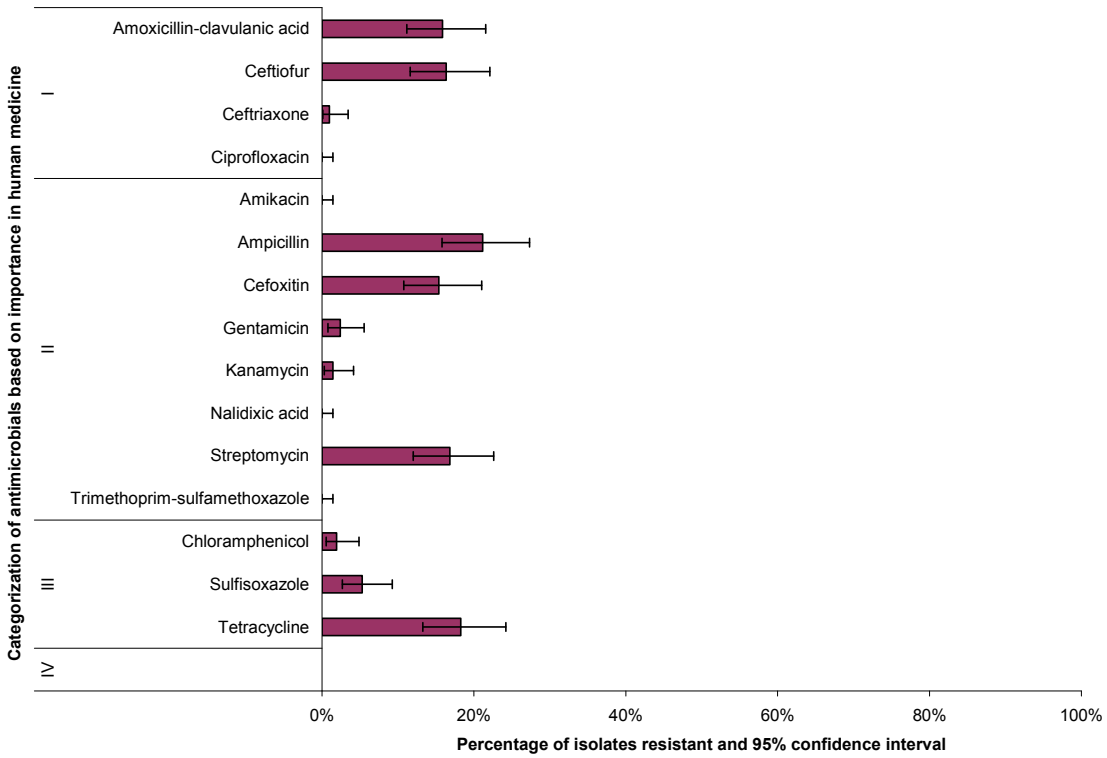


Table 13. Number of antimicrobials in resistance patterns of *Salmonella* serovars from chickens; *Surveillance of Animal Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Enteritidis	99 (47.6)	99	0	0	0
Kentucky	38 (18.3)	4	22	12	0
Heidelberg	30 (14.4)	19	10	1	0
Typhimurium	10 (4.8)	5	3	2	0
I 4,[5],12:i:-	5 (2.4)	3	1	1	0
Less common serovars	26 (12.5)	12	10	0	4
Total	**208 (100)**	**142**	**46**	**16**	**4**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Escherichia coli

Abattoir Surveillance

(n = 170)

Figure 15. Resistance to specific antimicrobials in *E. coli* isolates from chickens; *Abattoir Surveillance*, 2008.

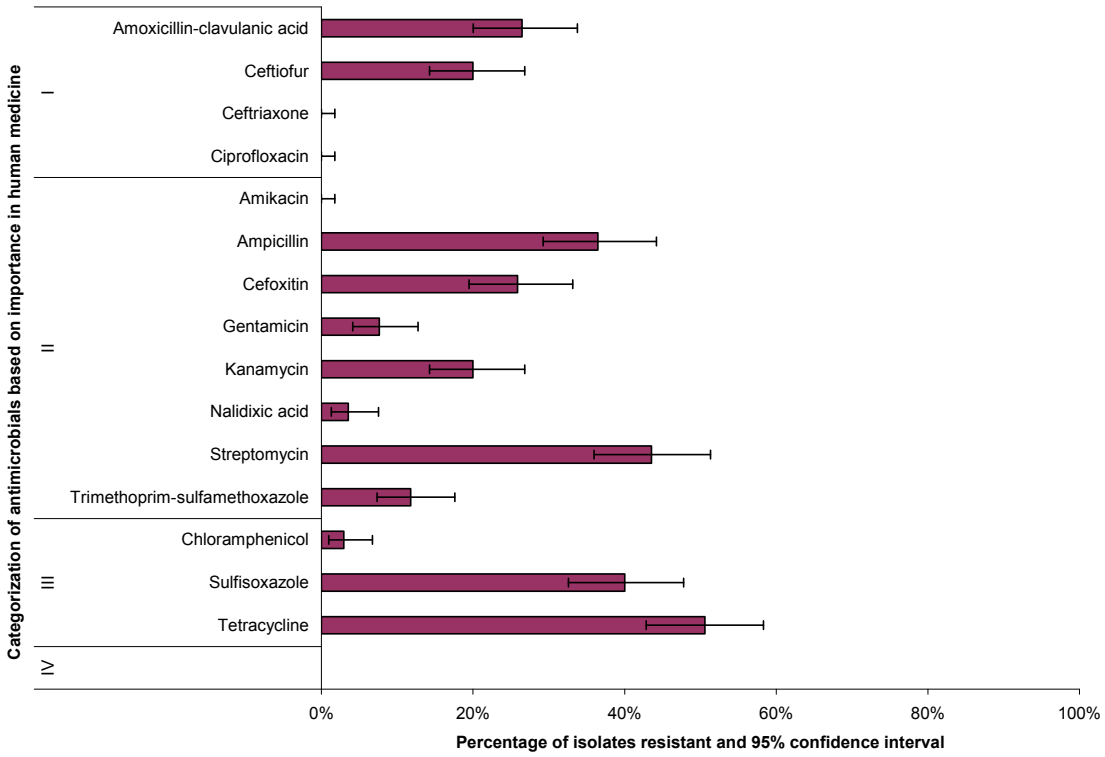
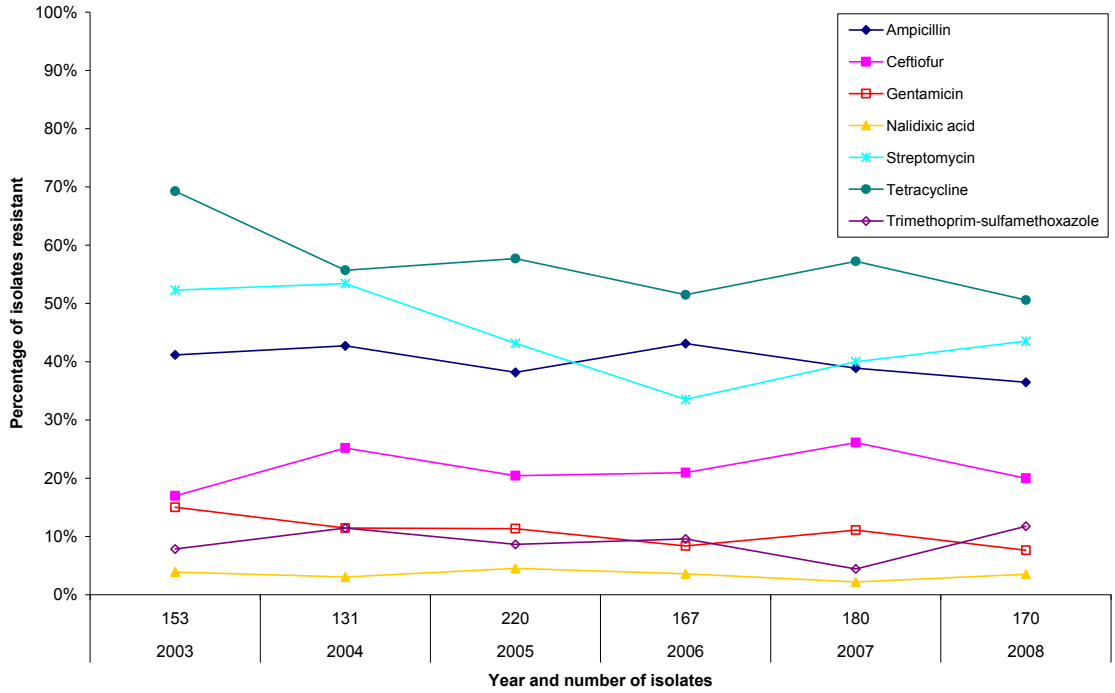


Figure 16. Temporal variation of the resistance to selected antimicrobials in *E. coli* isolates from chickens; *Abattoir Surveillance*, 2003–2008.



Retail Meat Surveillance

(n = 480)

Figure 17. Resistance to specific antimicrobials in *E. coli* isolates from chicken; *Retail Meat Surveillance*, 2008.

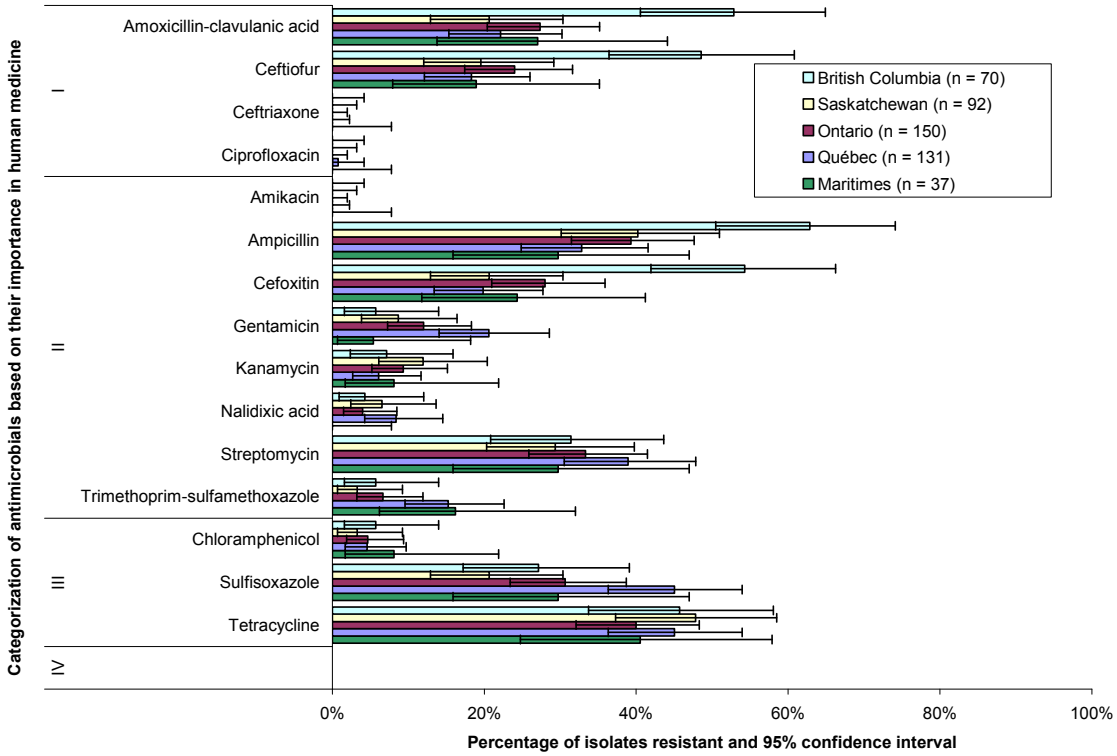
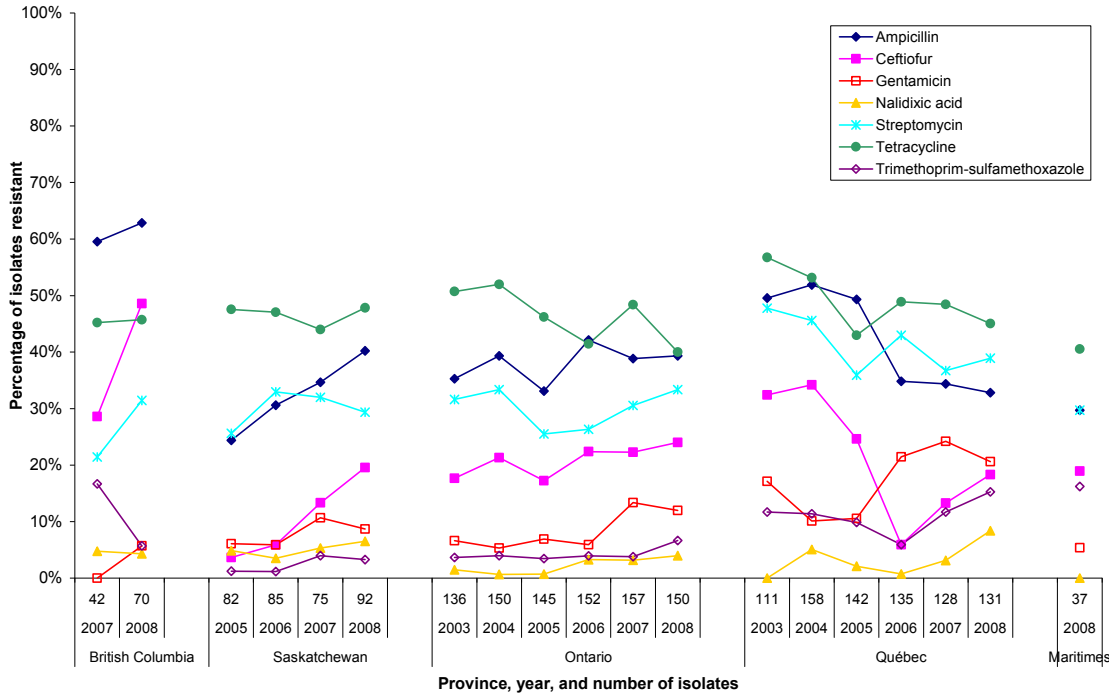


Figure 18. Temporal variation of the resistance to selected antimicrobials in *E. coli* isolates from chicken; *Retail Meat Surveillance*, 2003–2008.



Campylobacter

Retail Meat Surveillance

(n = 266)

Figure 19. Resistance to specific antimicrobials in *Campylobacter* isolates from chicken; *Retail Meat Surveillance*, 2008.

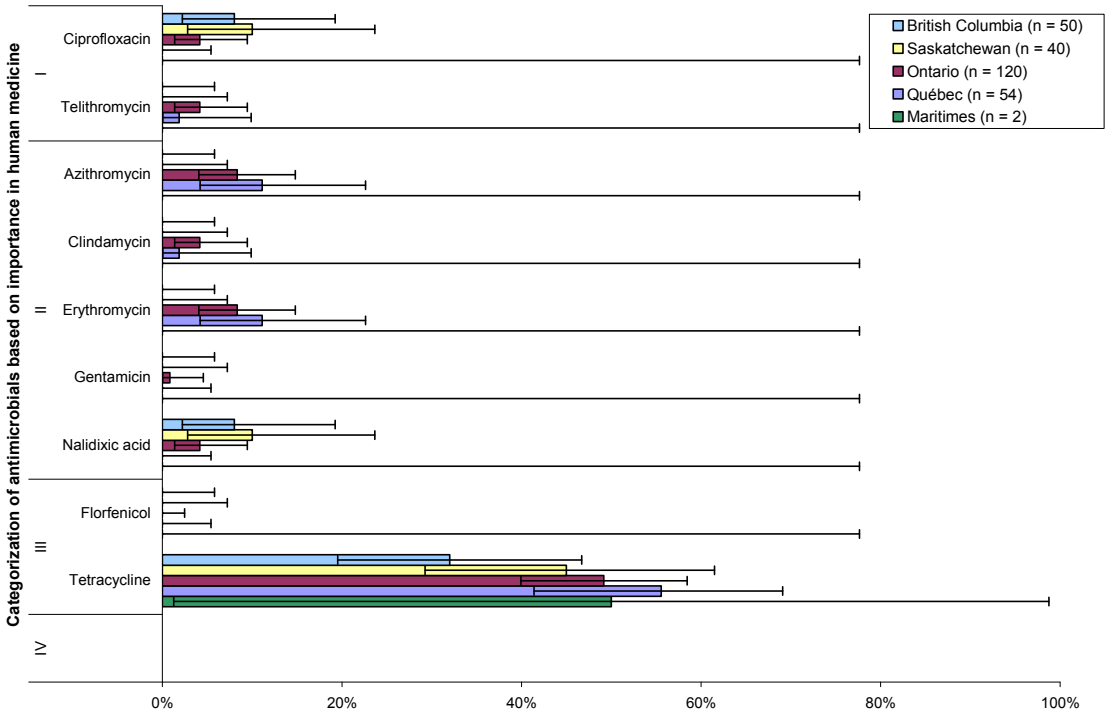


Figure 20. Resistance to specific antimicrobials in *Campylobacter* species from chicken; *Retail Meat Surveillance*, 2008.

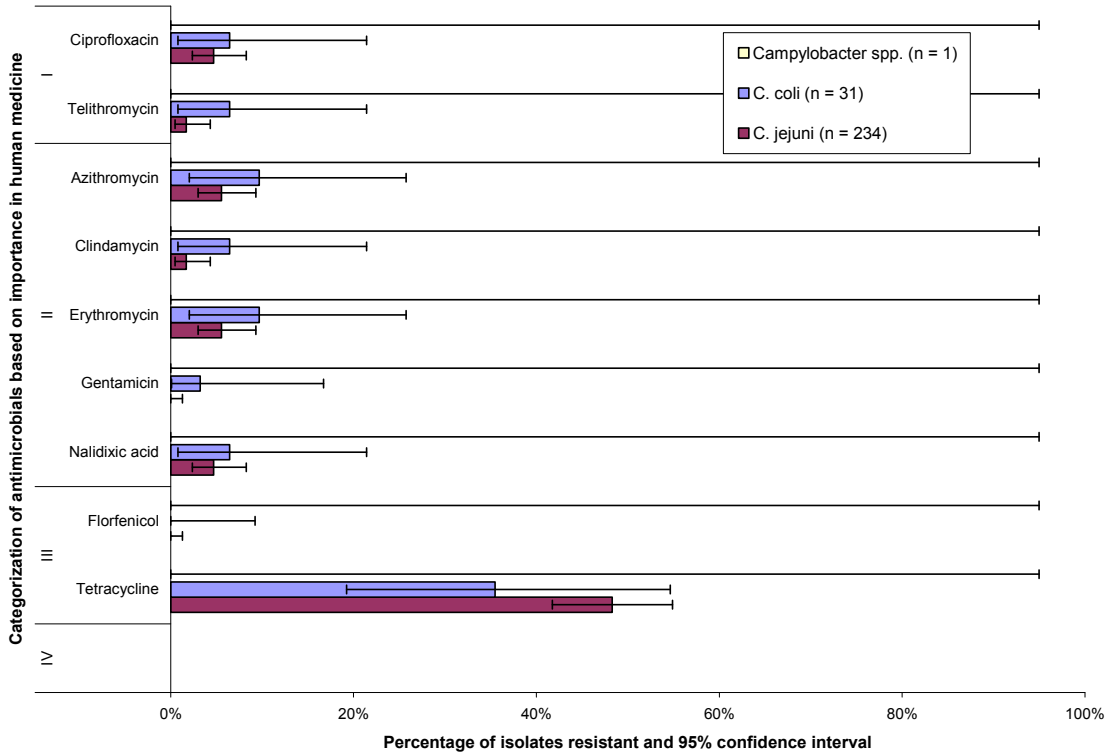
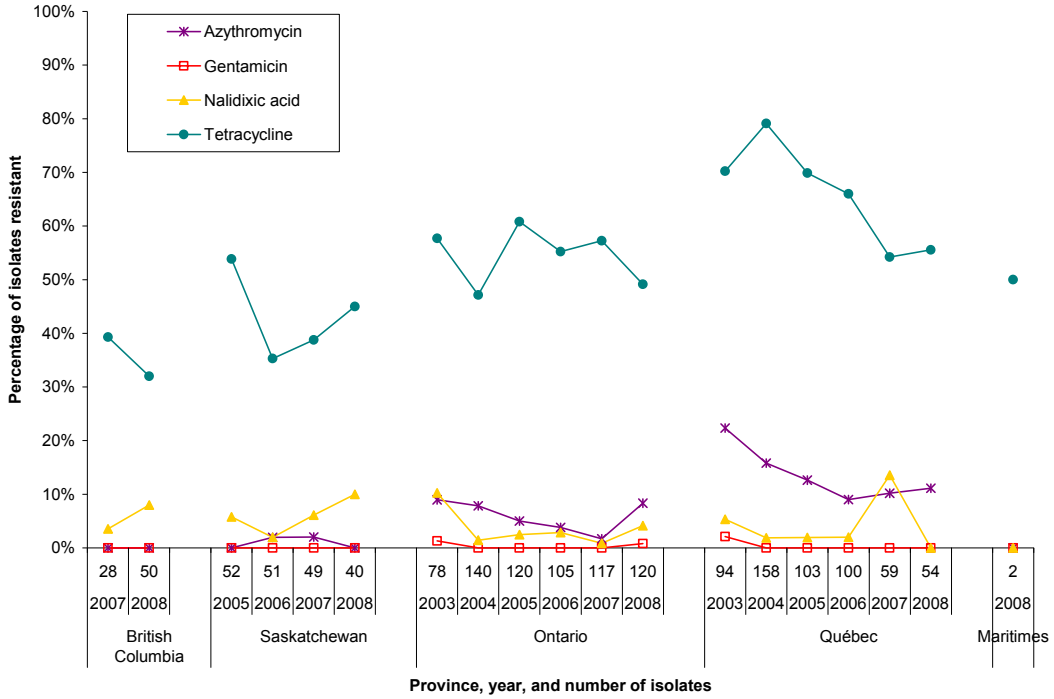


Table 14. Number of antimicrobials in resistance patterns in *Campylobacter* species from chicken; *Retail Meat Surveillance*, 2008.

Species	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 2	3 - 4	5 - 9
		Number of isolates			
British Columbia					
C. jejuni	44 (88)	28	15	1	0
C. coli	6 (12)	4	1	1	0
Total	**50 (100)**	**32**	**16**	**2**	**0**
Saskatchewan					
C. jejuni	37 (92.5)	19	14	4	0
C. coli	3 (7.5)	3	0	0	0
Total	**40 (100)**	**22**	**14**	**4**	**0**
Ontario					
C. jejuni	104 (86.7)	49	46	8	1
C. coli	16 (13.3)	8	5	1	2
Total	**120 (100)**	**57**	**51**	**9**	**3**
Québec					
C. jejuni	49 (90.7)	20	23	5	1
C. coli	5 (9.3)	4	1	0	0
Total	**54 (100)**	**24**	**24**	**5**	**1**
Maritimes					
C. coli	1 (50)	0	1	0	0
Campylobacter spp.	1 (50)	1	0	0	0
Total	**2 (100)**	**1**	**1**	**0**	**0**
Grand total	**266 (100)**	**136**	**106**	**20**	**4**

Figure 21. Temporal variation of the resistance to selected antimicrobials in *Campylobacter* isolates from chicken; *Retail Meat Surveillance*, 2003–2008.

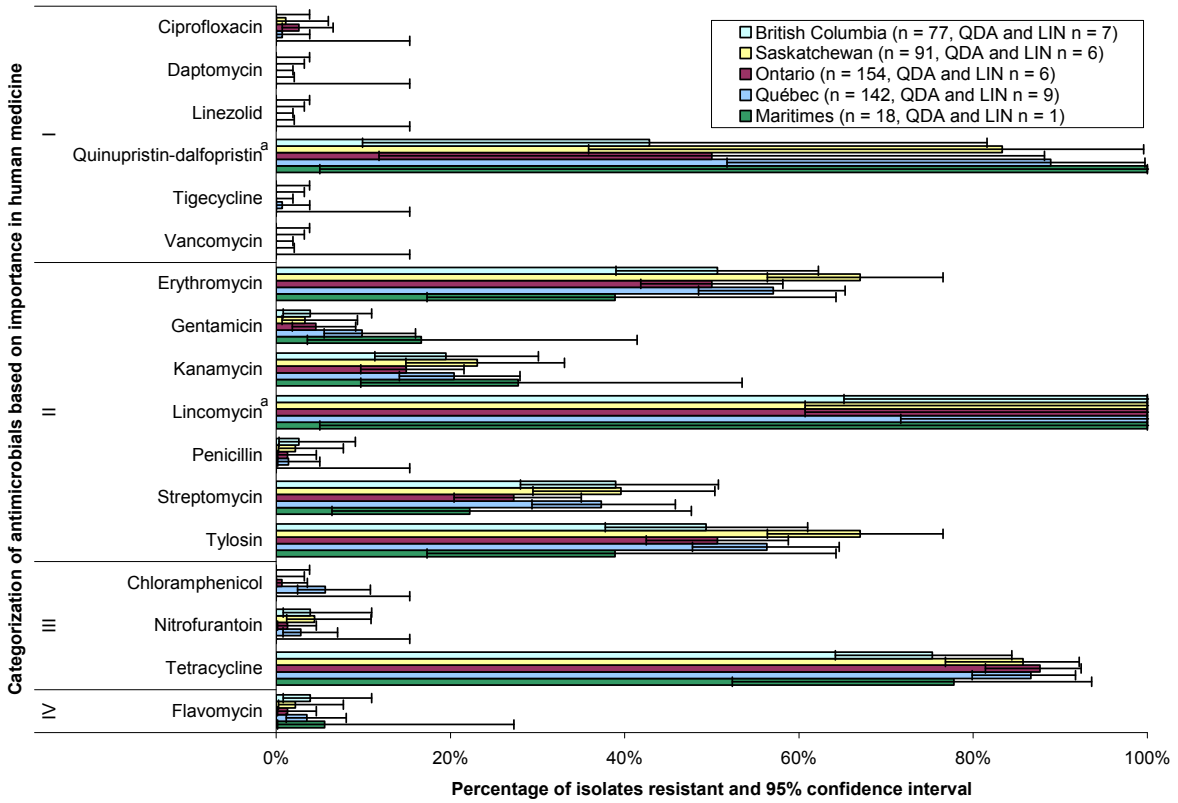


Enterococcus

Retail Meat Surveillance

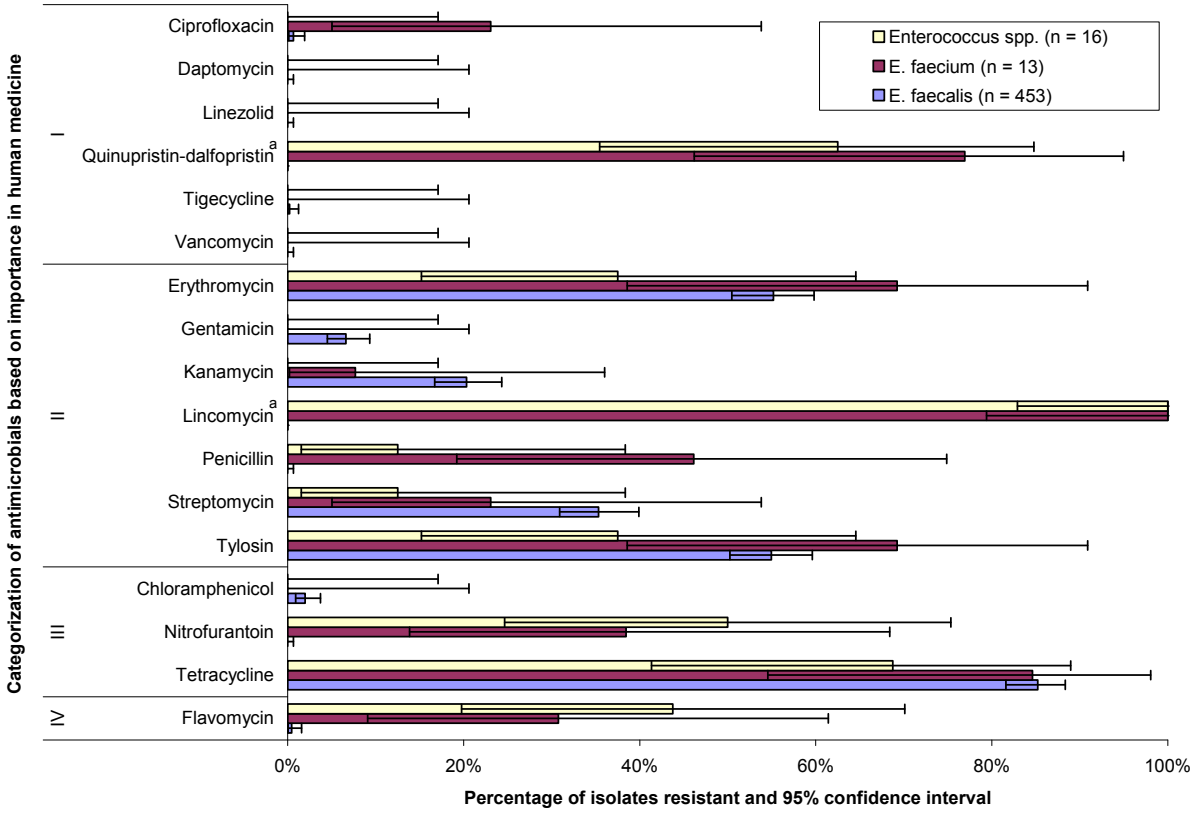
(n = 482)

Figure 22. Resistance to specific antimicrobials in *Enterococcus* isolates from chicken; *Retail Meat Surveillance*, 2008.



[a] Resistance to quinupristin-dalfopristin (QDA) and lincomycin (LIN) is not reported for E. faecalis because E. faecalis is intrinsically resistant to these antimicrobials.

Figure 23. Resistance to specific antimicrobials in *Enterococcus* species from chicken; *Retail Meat Surveillance*, 2008.



[a] Resistance to quinupristin-dalfopristin and lincomycin is not reported for *E*. faecalis because *E*. faecalis is intrinsically resistant to these antimicrobials.

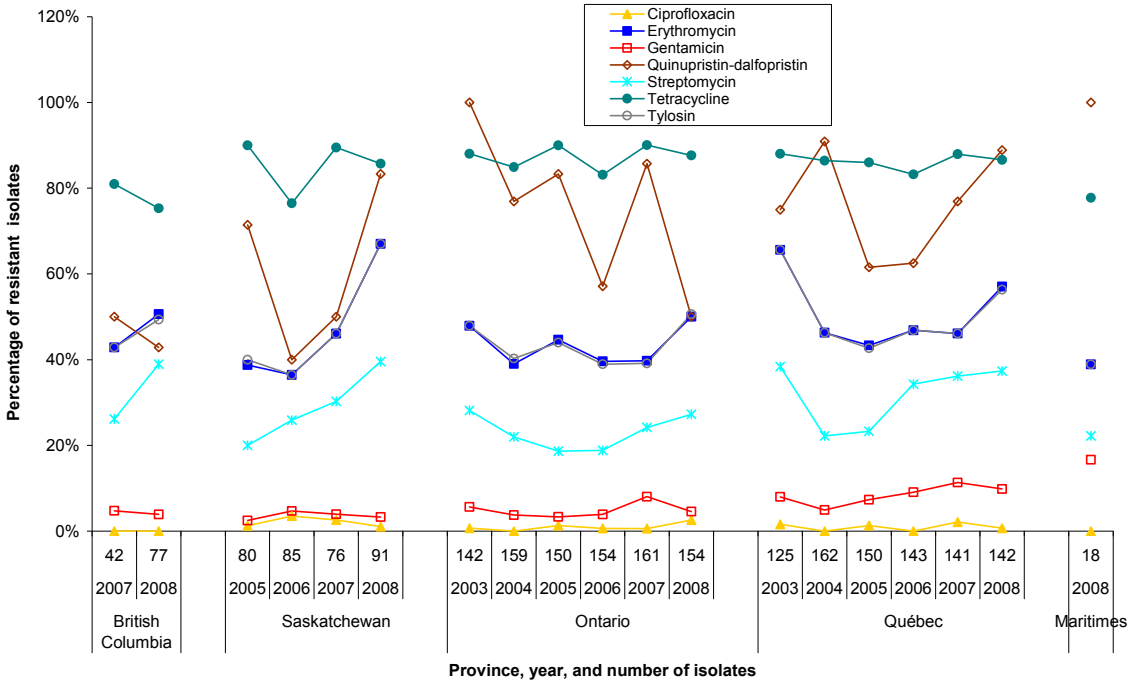
Table 15. Number of antimicrobials in resistance patterns of *Enterococcus* species from chicken; *Retail Meat Surveillance*, 2008.

Species	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 17
		Number of isolates			
British Columbia					
E. faecalis	70 (90.9)	3	55	12	0
Enterococcus spp.	4 (5.2)	0	3	1	0
E. faecium	3 (3.9)	0	2	1	0
Total	**77 (100)**	**3**	**60**	**14**	**0**
Saskatchewan					
E. faecalis	85 (93.4)	6	62	17	0
Enterococcus spp.	5 (5.5)	0	3	2	0
E. faecium	1 (1.1)	0	0	1	0
Total	**91 (100)**	**6**	**65**	**20**	**0**
Ontario					
E. faecalis	148 (96.1)	12	114	22	0
E. faecium	3 (1.9)	0	0	3	0
Enterococcus spp.	3 (1.9)	0	3	0	0
Total	**154 (100)**	**12**	**117**	**25**	**0**

Table 15. Number of antimicrobials in resistance patterns of *Enterococcus* species from chicken; *Retail Meat Surveillance*, 2008.

Species	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 17
		Number of isolates			
Québec					
E. faecalis	133 (93.7)	15	90	28	0
E. faecium	5 (3.5)	0	1	4	0
Enterococcus spp.	4 (2.8)	0	0	4	0
Total	**142 (100)**	**15**	**91**	**36**	**0**
Maritimes					
E. faecalis	17 (94.4)	4	9	4	0
E. faecium	1 (5.6)	0	0	1	0
Total	**18 (100)**	**4**	**9**	**5**	**0**
Grand Total	**482 (100)**	**40**	**342**	**100**	**0**

Figure 24. Temporal variation of the resistance to selected antimicrobials in *Enterococcus* isolates from chicken; *Retail Meat Surveillance*, 2003–2008.



Resistance to quinupristin-dalfopristin is not reported for *E. faecalis* because *E. faecalis* is intrinsically resistant to that antimicrobial.

Pigs

Salmonella

Farm Surveillance

(n = 61)

Figure 25. Resistance to specific antimicrobials in *Salmonella* isolates from pigs; *Farm Surveillance*, 2008.

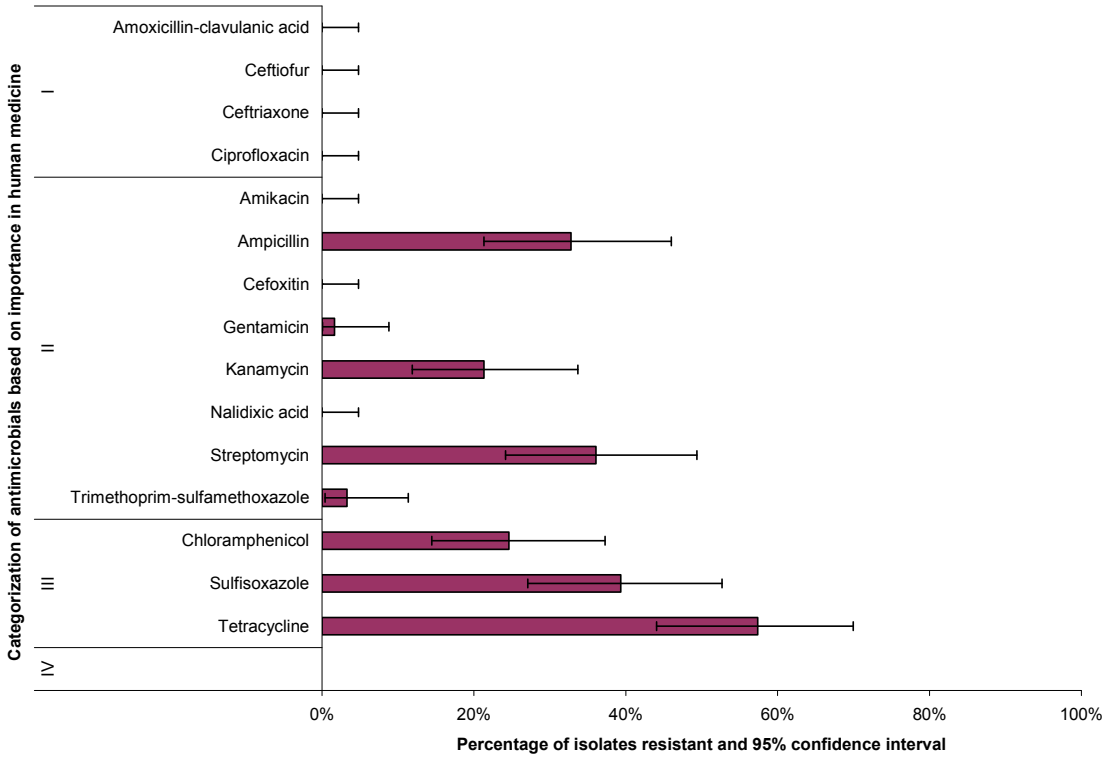


Table 16. Number of antimicrobials in resistance patterns of *Salmonella* serovars from pigs; *Farm Surveillance*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Typhimurium var. 5-	17 (27.9)	5	4	8	0
Brandenburg	9 (14.8)	0	9	0	0
Derby	7 (11.5)	0	7	0	0
Bovismorbificans	4 (6.6)	2	2	0	0
Mbandaka	4 (6.6)	2	2	0	0
Typhimurium	3 (4.9)	0	0	3	0
I 4,[5],12:i:-	2 (3.3)	1	0	1	0
Infantis	2 (3.3)	2	0	0	0
London	2 (3.3)	2	0	0	0
Less common serovars	11 (18)	9	0	2	0
Total	**61 (100)**	**23**	**24**	**14**	**0**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Abattoir Surveillance

(n = 151)

Figure 26. Resistance to specific antimicrobials in *Salmonella* isolates from pigs; *Abattoir Surveillance*, 2008.

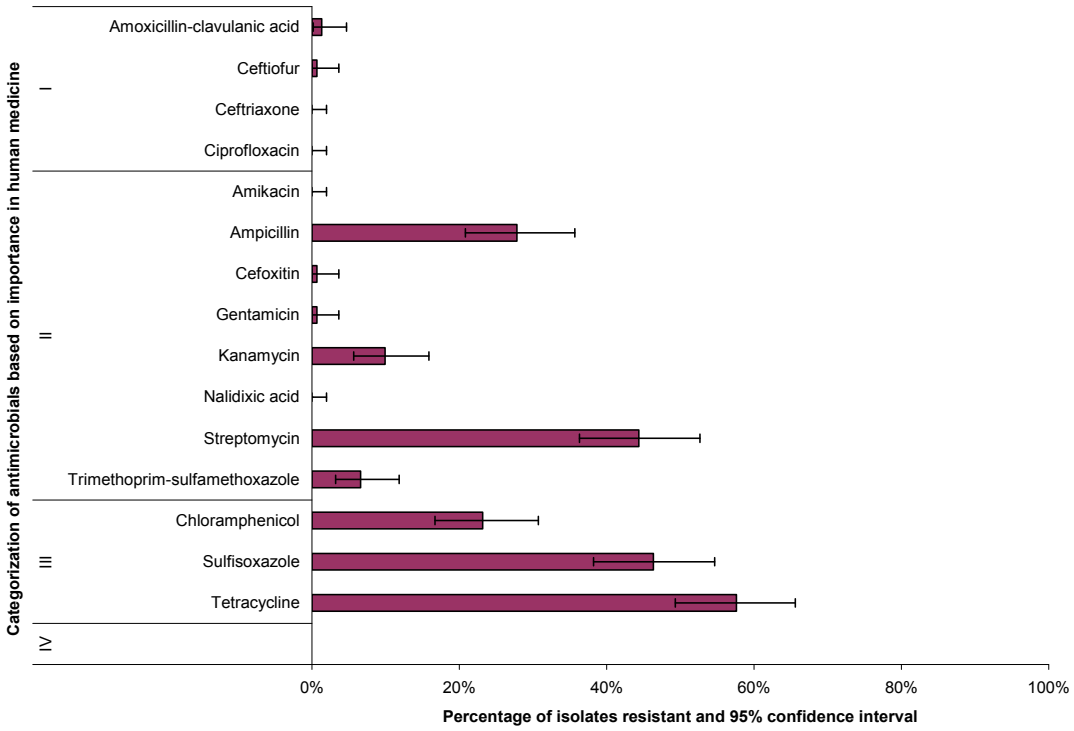


Figure 27. Temporal variation of the resistance to selected antimicrobials in *Salmonella* isolates from pigs; *Abattoir Surveillance*, 2003-2008.

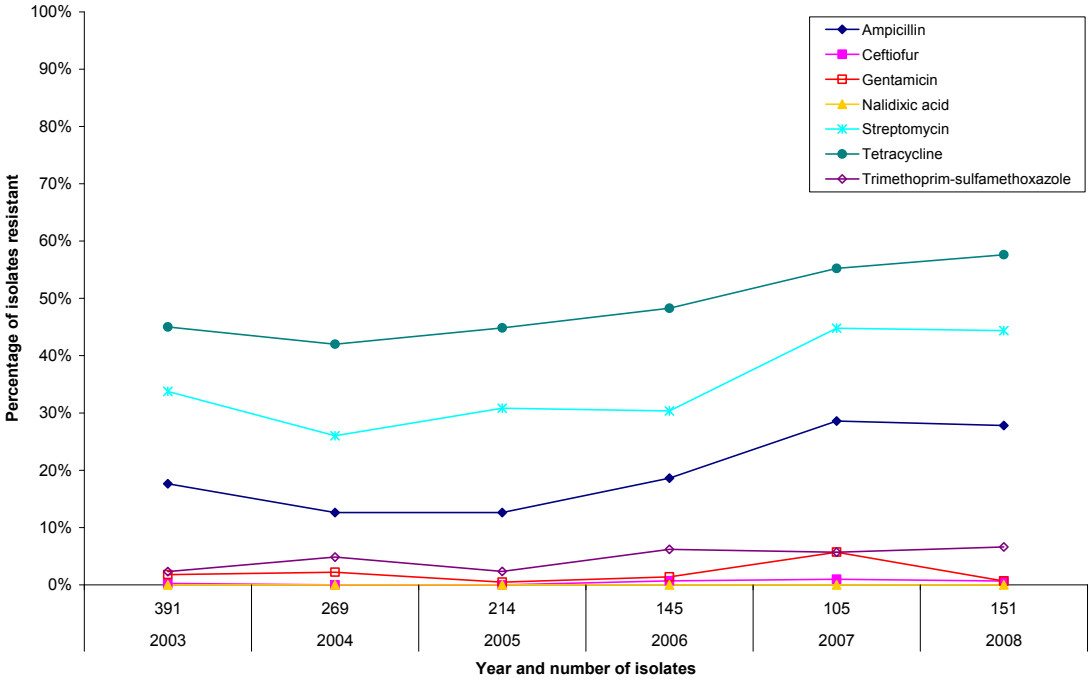


Table 17. Number of antimicrobials in resistance patterns of *Salmonella* serovars from pigs; *Abattoir Surveillance*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Derby	33 (21.9)	4	28	1	0
Typhimurium var. 5-	31 (20.5)	1	8	22	0
Typhimurium	17 (11.3)	2	5	10	0
Brandenburg	10 (6.6)	4	6	0	0
Infantis	8 (5.3)	7	1	0	0
Worthington	7 (4.6)	1	6	0	0
Uganda	6 (4)	6	0	0	0
Bovismorbificans	4 (2.6)	4	0	0	0
Give	4 (2.6)	3	1	0	0
Mbandaka	4 (2.6)	4	0	0	0
Ohio	4 (2.6)	1	1	2	0
Ohio var. 14+	4 (2.6)	4	0	0	0
Less common serovars	19 (12.6)	14	4	1	0
Total	**151 (100)**	**55**	**60**	**36**	**0**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Surveillance of Animal Clinical Isolates

(n = 155)

Figure 28. Resistance to specific antimicrobials in *Salmonella* isolates from pigs; *Surveillance of Animal Clinical Isolates*, 2008.

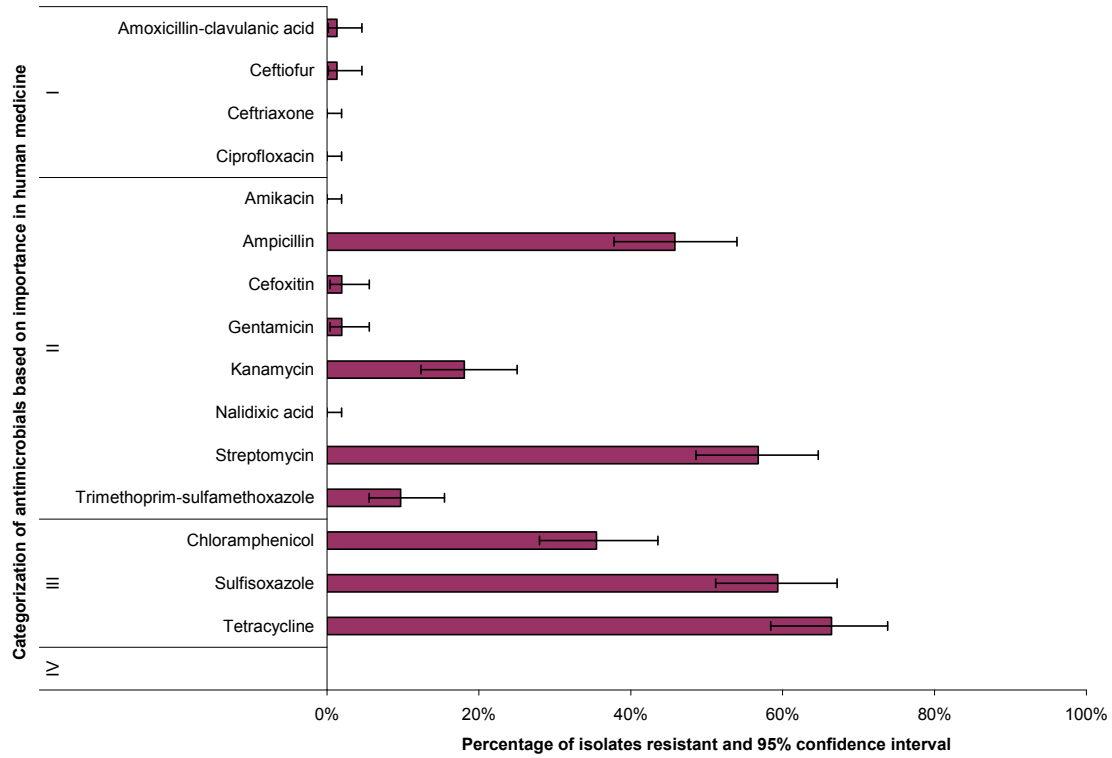


Table 18. Number of antimicrobials in resistance patterns of *Salmonella* serovars from pigs; *Surveillance of Animal Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Typhimurium	60 (38.7)	13	18	29	0
Typhimurium var. 5-	27 (17.4)	2	2	23	0
Derby	15 (9.7)	1	14	0	0
I 4,[5],12:i:-	8 (5.2)	2	2	4	0
Brandenburg	7 (4.5)	7	0	0	0
Infantis	5 (3.2)	3	1	0	1
Enteritidis	4 (2.6)	4	0	0	0
Less common serovars	29 (18.7)	11	14	4	0
Total	**155 (100)**	**43**	**51**	**60**	**1**

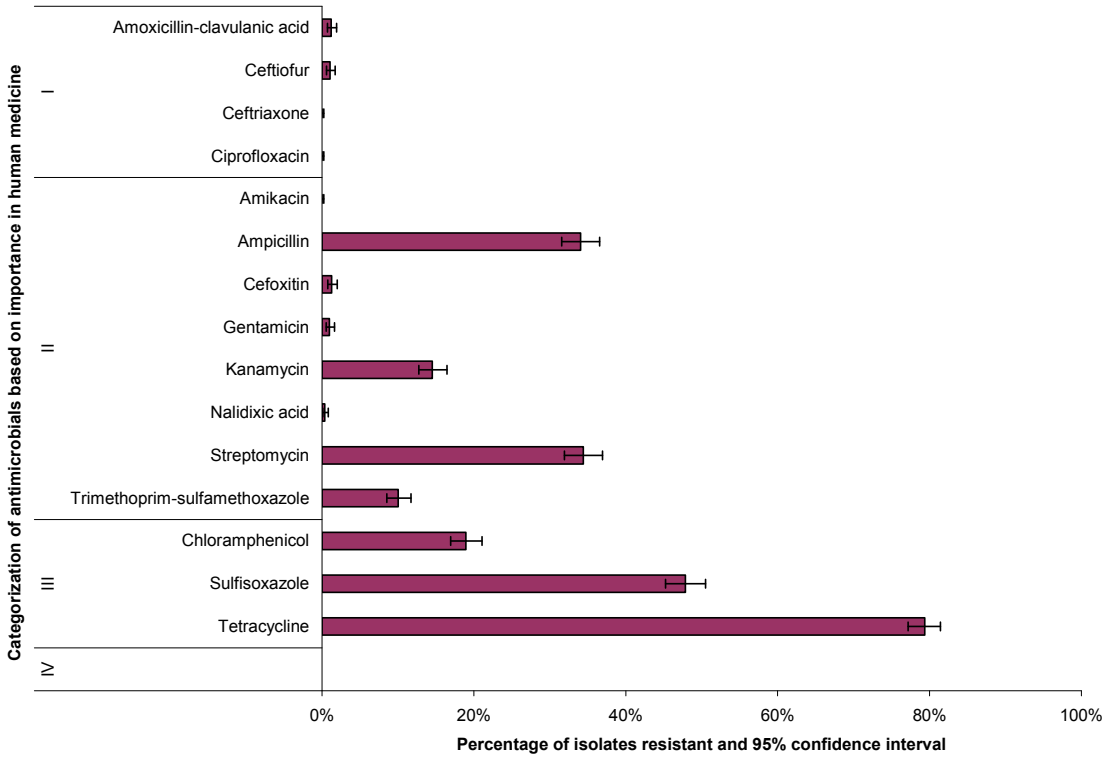
Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Escherichia coli

Farm Surveillance

(n = 1425)

Figure 29. Resistance to specific antimicrobials in *E. coli* isolates from pigs; *Farm Surveillance*, 2008.



Abattoir Surveillance

(n = 150)

Figure 30. Resistance to specific antimicrobials in *E. coli* isolates from pigs; *Abattoir surveillance*, 2008.

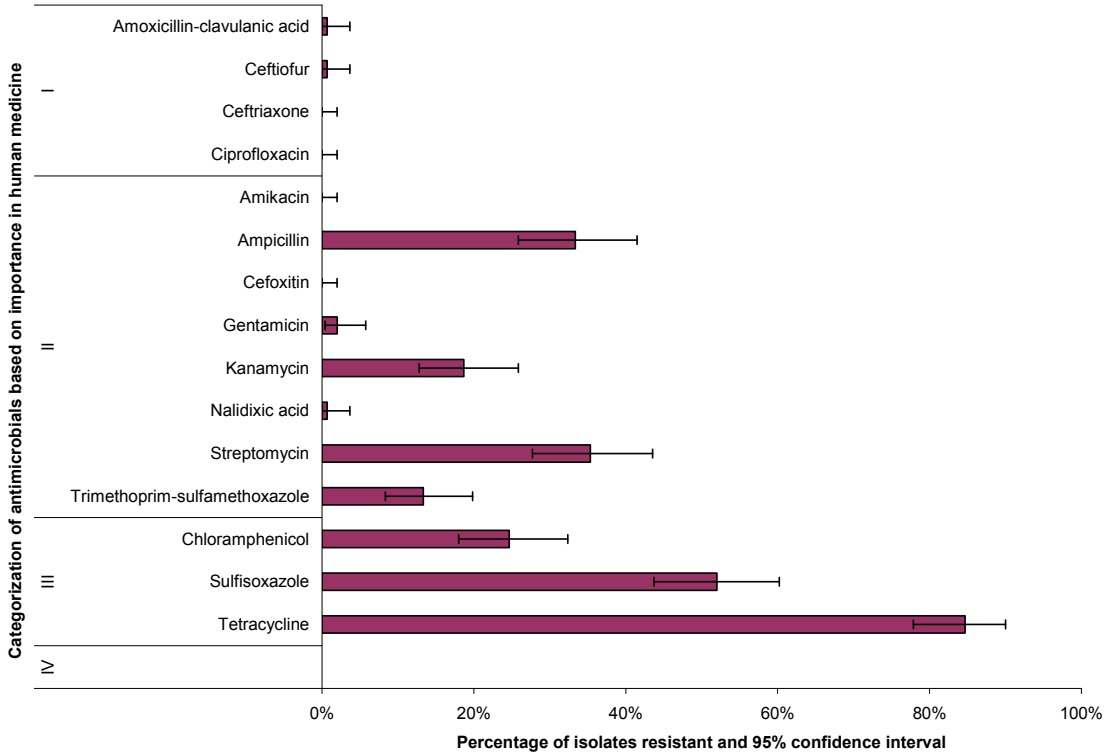
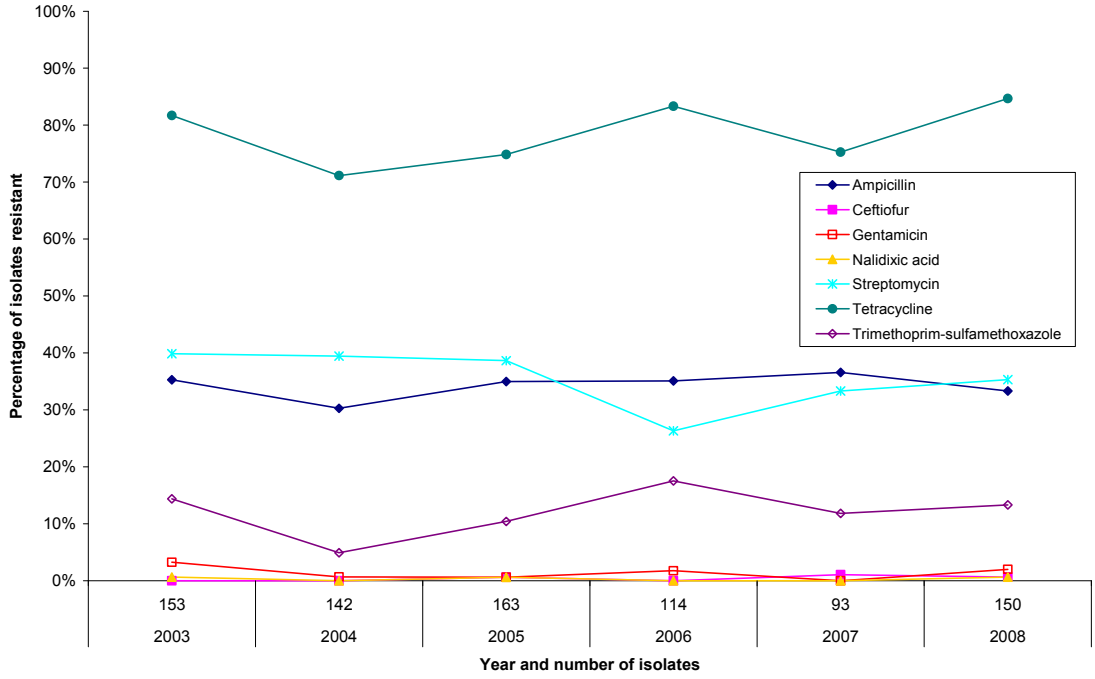


Figure 31. Temporal variation of the resistance to selected antimicrobials in *E. coli* isolates from pigs; *Abattoir Surveillance*, 2003–2008.



Retail Meat Surveillance

(n = 318)

Figure 32. Resistance to specific antimicrobials in *E. coli* isolates from pork; *Retail Meat Surveillance*, 2008.

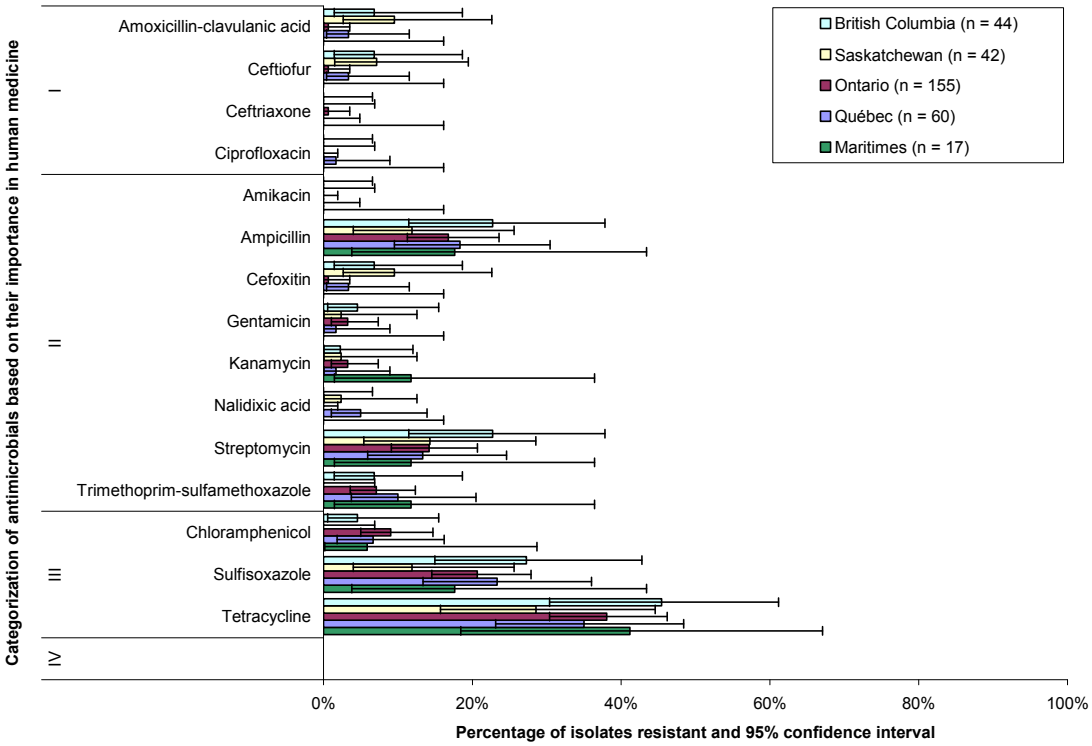
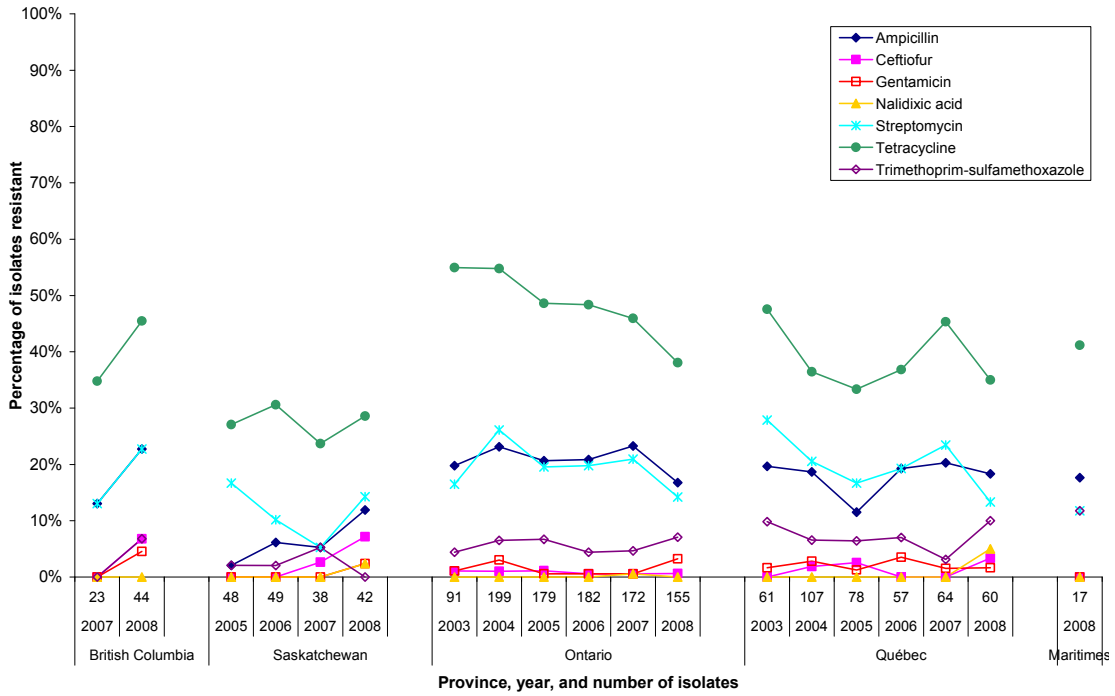


Figure 33. Temporal variation of the resistance to selected antimicrobials in *E. coli* isolates from pork; *Retail Meat Surveillance*, 2003–2008.

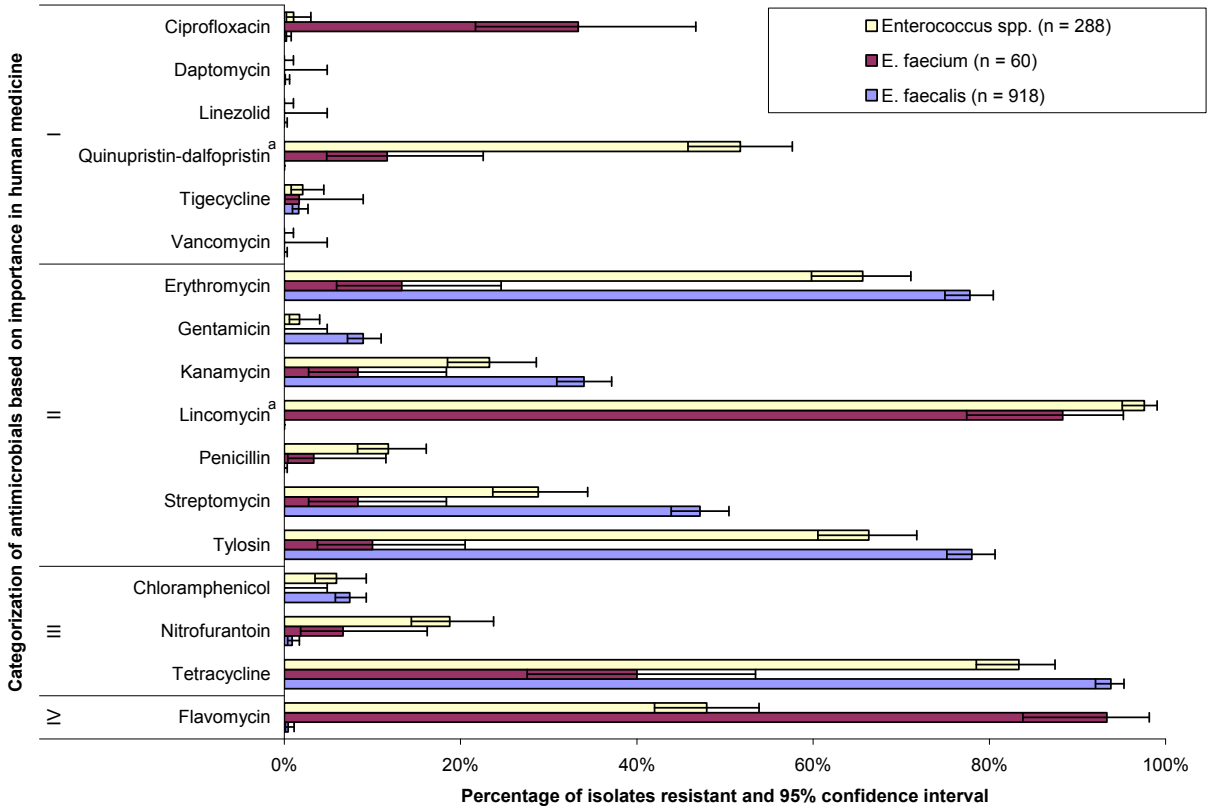


Enterococcus

Farm Surveillance

(n = 1266)

Figure 34. Resistance to specific antimicrobials in *Enterococcus* species from pigs; *Farm Surveillance*, 2008.



[a] Resistance to quinupristin-dalfopristin and lincomycin is not reported for *E. faecalis* because *E. faecalis* is intrinsically resistant to these antimicrobials.

Table 19. Number of antimicrobials in resistance patterns in *Enterococcus* species from pigs; *Farm Surveillance*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 17
		Number of isolates			
E. faecalis	918 (72.5)	50	560	308	0
E. faecium	60 (4.7)	1	51	7	1
Enterococcus spp.	288 (22.7)	2	102	169	15
Total	**1266 (100)**	**53**	**713**	**484**	**16**

Turkeys

Salmonella

Animal Clinical Isolates

(n = 32)

Figure 35. Resistance to specific antimicrobials in *Salmonella* isolates from turkeys; *Surveillance of Animal Clinical Isolates*, 2008.

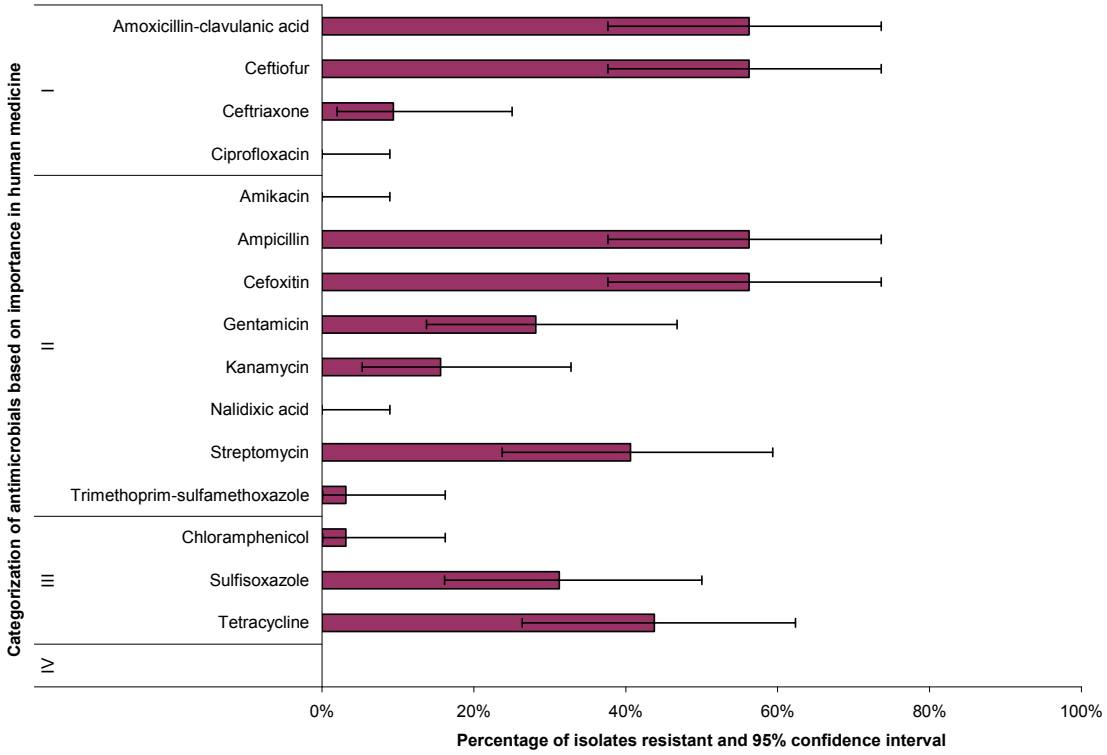


Table 20. Number of antimicrobials in resistance patterns of *Salmonella* serovars from turkeys; *Surveillance of Animal Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Typhimurium	7 (21.9)	0	6	1	0
Agona	4 (12.5)	0	4	0	0
Hadar	4 (12.5)	0	4	0	0
Heidelberg	4 (12.5)	0	4	0	0
Bredeney	3 (9.4)	0	0	2	1
Senftenberg	3 (9.4)	0	0	1	2
Anatum	1 (3.1)	0	1	0	0
Give	1 (3.1)	1	0	0	0
I 4,[5],12:-:-	1 (3.1)	0	0	1	0
Manhattan	1 (3.1)	1	0	0	0
Montevideo	1 (3.1)	0	0	1	0
Ouakam	1 (3.1)	0	1	0	0
Saintpaul	1 (3.1)	1	0	0	0
Total	**32 (100)**	**3**	**20**	**6**	**3**

Horses

Salmonella

Surveillance of Animal Clinical Isolates

(n = 62)

Figure 36. Resistance to specific antimicrobials in *Salmonella* isolates from horses; *Surveillance of Animal Clinical Isolates*, 2008.

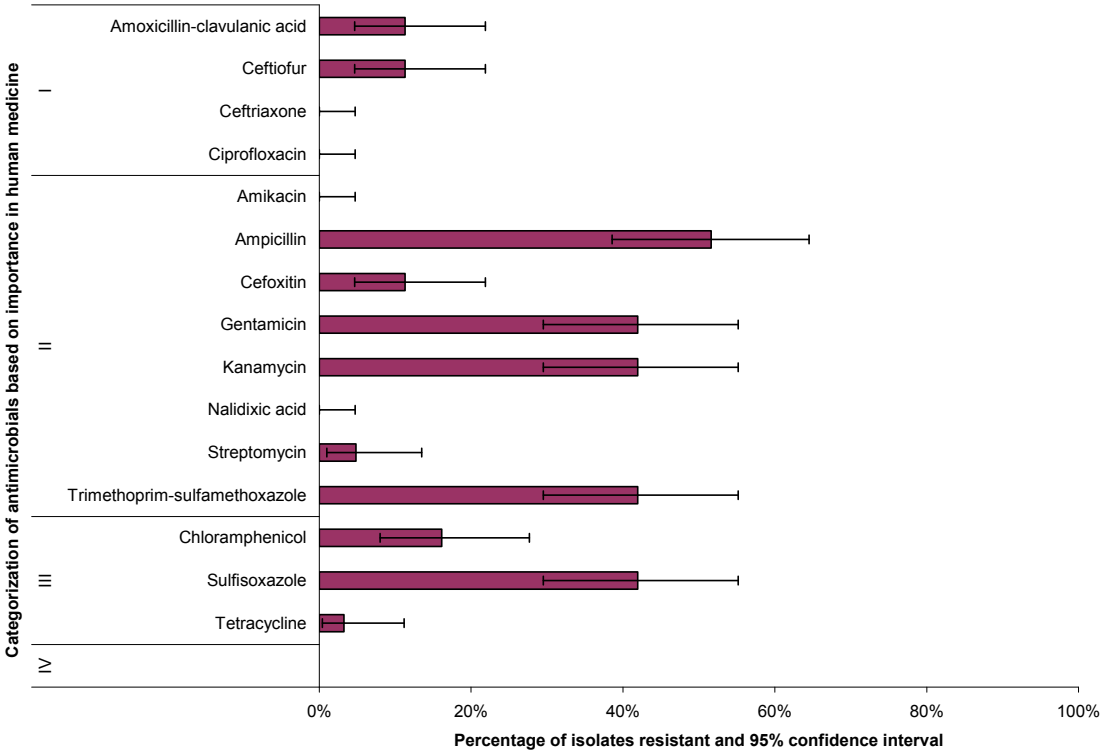


Table 21. Number of antimicrobials in resistance patterns of *Salmonella* serovars from horses; *Surveillance of Animal Clinical Isolates*, 2008.

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1 - 4	5 - 8	9 - 15
		Number of isolates			
Heidelberg	26 (41.9)	0	0	26	0
Newport	8 (12.9)	8	0	0	0
Typhimurium	6 (9.7)	6	0	0	0
Litchfield	5 (8.1)	0	5	0	0
Thompson	5 (8.1)	5	0	0	0
Oranienburg	4 (6.5)	4	0	0	0
Agona	2 (3.2)	0	2	0	0
Less common serovars	6 (9.7)	5	1	0	0
Total	**62 (100)**	**28**	**8**	**26**	**0**

Serovars with a prevalence of less than 2% are categorized as “Less common serovars”.

Appendix – Additional Tables

Minimum Inhibitory Concentrations (MICs) Distributions

Humans

Table A. 1. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Enteritidis isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	1259	≤ 1	≤ 1	0.2							94.5	2.9	0.3	1.9	0.1	**0.2**	**0.1**			
	Ceftiofur	1259	1	1	0.2				0.2	0.2	3.3	94.8	1.5			**0.2**					
	Ceftriaxone	1259	≤ 0.25	≤ 0.25	0.0					99.7	0.2					0.2					
	Ciprofloxacin	1259	≤ 0.015	0.12	0.0	82.4	3.7	0.3	7.4	4.7	1.5										
II	Amikacin	1259	1	2	0.0						12.8	75.5	11.3	0.5							
	Ampicillin	1259	≤ 1	≤ 1	2.6							90.5	6.4	0.6				**2.6**			
	Cefoxitin	1259	2	2	0.2							3.6	89.2	6.2	0.8		**0.2**	**0.1**			
	Gentamicin	1259	≤ 0.25	0.50	0.2					68.5	30.1	1.2				**0.2**	**0.1**				
	Kanamycin	1259	≤ 8	≤ 8	0.2										99.8				**0.2**		
	Nalidixic acid	1259	4	> 32	12.5								24.2	61.2	1.0	1.1	**0.2**	**12.3**			
	Streptomycin	1259	≤ 32	≤ 32	0.9												99.1	**0.2**	**0.7**		
	Trimethoprim-sulphamethoxazole	1259	≤ 0.12	0.25	0.4				86.3	12.8	0.6			**0.1**	**0.3**						
III	Chloramphenicol	1259	4	8	0.1								0.6	59.5	39.6	0.3		**0.1**			
	Sulfisoxazole	1259	32	64	1.0											3.0	64.0	31.4	0.5	0.2	**1.0**
	Tetracycline	1259	≤ 4	≤ 4	1.6									98.4		**0.1**	**0.1**	**1.4**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 2. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Heidelberg isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	290	≤ 1	32	13.4							66.6	1.7	0.3	4.1	13.8	**7.9**	**5.5**			
	Ceftiofur	290	1	> 8	14.1				0.3		23.4	61.7	0.3		**0.3**	**13.8**					
	Ceftriaxone	290	≤ 0.25	16	0.3					85.9				0.3	0.3	11.4	1.7	**0.3**			
	Ciprofloxacin	290	≤ 0.015	≤ 0.015	0.0	99.7	0.3														
II	Amikacin	290	1	2	0.0						1.0	53.8	40.7	4.5							
	Ampicillin	290	≤ 1	> 32	31.7							67.2	1.0					**31.7**			
	Cefoxitin	290	2	32	13.1							31.7	49.0	5.2	0.7	0.3	**4.5**	**8.6**			
	Gentamicin	290	0.50	0.50	2.4					27.6	63.4	6.2	0.3			**0.3**	**2.1**				
	Kanamycin	290	≤ 8	≤ 8	1.0										98.6	0.3			**1.0**		
	Nalidixic acid	290	2	4	0.0								62.1	37.6	0.3						
	Streptomycin	290	≤ 32	≤ 32	6.9												93.1	**4.1**	**2.8**		
	Trimethoprim-sulphamethoxazole	290	≤ 0.12	0.25	1.4				77.6	20.7			0.3	**0.3**	**1.0**						
III	Chloramphenicol	290	8	8	0.7									16.9	81.7	0.7		**0.7**			
	Sulfisoxazole	290	32	64	3.8											22.1	67.6	6.6			**3.8**
	Tetracycline	290	≤ 4	≤ 4	6.2									93.8				**6.2**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 3. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Newport isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	177	≤ 1	≤ 1	1.1							96.6	0.6		1.7			1.1			
	Ceftiofur	177	1	1	1.7				0.6		27.7	70.1				1.7					
	Ceftriaxone	177	≤ 0.25	≤ 0.25	1.1					98.3							0.6	0.6	0.6		
	Ciprofloxacin	177	≤ 0.015	≤ 0.015	0.0	98.9			0.6	0.6											
II	Amikacin	177	1	2	0.0						0.6	60.5	37.9	1.1							
	Ampicillin	177	≤ 1	≤ 1	2.8							95.5	1.7					2.8			
	Cefoxitin	177	2	2	1.1						0.6	10.7	81.4	5.6	0.6			1.1			
	Gentamicin	177	0.50	0.50	0.6					27.7	69.5	1.1	1.1				0.6				
	Kanamycin	177	≤ 8	≤ 8	0.6										99.4				0.6		
	Nalidixic acid	177	2	4	1.1							1.1	71.8	26.0				1.1			
	Streptomycin	177	≤ 32	≤ 32	2.3												97.7	0.6	1.7		
	Trimethoprim-sulphamethoxazole	177	≤ 0.12	0.25	1.1				85.9	13.0					1.1						
III	Chloramphenicol	177	4	8	1.7								1.7	82.5	14.1			1.7			
	Sulfisoxazole	177	64	64	2.8											2.8	38.4	52.0	3.4	0.6	2.8
	Tetracycline	177	≤ 4	≤ 4	4.0									96.0		0.6		3.4			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 4. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Paratyphi A and Paratyphi B isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	65	≤ 1	2	3.1							55.4	40.0			1.5	3.1				
	Ceftiofur	65	1	1	1.5						6.2	90.8	1.5			1.5					
	Ceftriaxone	65	≤ 0.25	≤ 0.25	0.0					98.5						1.5					
	Ciprofloxacin	65	0.50	0.50	0.0	26.2	1.5				70.8	1.5									
II	Amikacin	65	0.50	1	0.0						75.4	15.4	9.2								
	Ampicillin	65	2	2	4.6							16.9	76.9		1.5			4.6			
	Cefoxitin	65	4	8	1.5							4.6	12.3	69.2	12.3			1.5			
	Gentamicin	65	≤ 0.25	0.50	1.5					83.1	12.3	3.1					1.5				
	Kanamycin	65	≤ 8	≤ 8	1.5										98.5				1.5		
	Nalidixic acid	65	> 32	> 32	72.3								10.8	16.9				72.3			
	Streptomycin	65	≤ 32	≤ 32	4.6												95.4		4.6		
	Trimethoprim-sulphamethoxazole	65	≤ 0.12	0.25	1.5				58.5	40.0					1.5						
III	Chloramphenicol	65	8	8	4.6									9.2	84.6	1.5		4.6			
	Sulfisoxazole	65	32	64	4.6											7.7	75.4	12.3			4.6
	Tetracycline	65	≤ 4	≤ 4	6.2									93.8			1.5	4.6			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 5. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Typhi isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	186	≤ 1	8	0.0							82.8	0.5	1.1	11.3	4.3					
	Ceftiofur	186	0.50	1	0.0				1.1	2.2	75.3	21.5									
	Ceftriaxone	186	≤ 0.25	≤ 0.25	0.0					100.0											
	Ciprofloxacin	186	0.25	0.25	0.0	16.1			11.8	14.5	51.1	5.9		0.5							
II	Amikacin	186	1	1	0.0						10.2	85.5	4.3								
	Ampicillin	186	≤ 1	> 32	16.7							82.8	0.5					**16.7**			
	Cefoxitin	186	4	8	0.0						1.1	20.4	13.4	53.2	11.8						
	Gentamicin	186	≤ 0.25	0.50	0.0					82.3	17.2	0.5									
	Kanamycin	186	≤ 8	≤ 8	0.5										99.5				**0.5**		
	Nalidixic acid	186	> 32	> 32	69.4							1.1	13.4	14.5	1.6			**69.4**			
	Streptomycin	186	≤ 32	> 64	17.7												82.3	**1.1**	**16.7**		
	Trimethoprim-sulphamethoxazole	186	≤ 0.12	> 4	17.2				72.6	10.2					**17.2**						
III	Chloramphenicol	186	4	> 32	17.7								1.6	67.2	13.4			**17.7**			
	Sulfisoxazole	186	32	> 256	18.3											28.0	45.7	7.5	0.5		**18.3**
	Tetracycline	186	≤ 4	≤ 4	5.9									94.1				**5.9**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 6. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* Typhimurium isolates; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	471	≤ 1	16	2.5							68.2	0.8	1.5	11.3	15.7	**0.8**	**1.7**			
	Ceftiofur	471	1	1	2.3						10.2	85.8	1.7			**2.3**					
	Ceftriaxone	471	≤ 0.25	≤ 0.25	0.8					97.5	0.2					0.8	0.6	**0.6**	**0.2**		
	Ciprofloxacin	471	≤ 0.015	≤ 0.015	0.0	94.7	2.1		0.4	1.7	0.8	0.2									
II	Amikacin	471	2	2	0.0							46.7	50.7	2.5							
	Ampicillin	471	≤ 1	> 32	30.8							66.9	1.9	0.4			**0.4**	**30.4**			
	Cefoxitin	471	2	4	2.3							7.9	78.8	9.3	1.7		**0.2**	**2.1**			
	Gentamicin	471	0.50	1	2.5					13.4	74.7	9.3				**0.2**	**2.3**				
	Kanamycin	471	≤ 8	> 64	12.5										87.3	0.2		**0.2**	**12.3**		
	Nalidixic acid	471	2	4	2.1								61.1	35.0	1.5	0.2		**2.1**			
	Streptomycin	471	≤ 32	> 64	30.6												69.4	**15.1**	**15.5**		
	Trimethoprim-sulphamethoxazole	471	≤ 0.12	0.25	5.5				55.8	36.7	2.3			**0.2**	**4.9**						
III	Chloramphenicol	471	8	> 32	21.2								0.6	33.3	44.4	0.4		**21.2**			
	Sulfisoxazole	471	32	> 256	33.1											3.0	52.3	11.7	0.2		**33.1**
	Tetracycline	471	≤ 4	> 32	32.3									67.7		**8.1**	**9.8**	**14.4**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 7. Distribution of MICs (ug/mL) for specific antimicrobials in other *Salmonella* serovars; *Surveillance of human Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs													
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	1152	≤ 1	≤ 1	1.6							91.4	1.6	1.0	2.1	2.3	**0.4**	**1.2**			
	Ceftiofur	1152	1	1	1.8				0.1	0.3	28.6	67.2	1.7	0.2	**0.2**	**1.6**					
	Ceftriaxone	1152	≤ 0.25	≤ 0.25	0.2					98.2				0.1	0.1	1.2	0.3	**0.1**	**0.1**		
	Ciprofloxacin	1152	≤ 0.015	≤ 0.015	1.0	92.1	1.0	0.7	1.2	2.2	1.0	0.7	0.1		**1.0**						
II	Amikacin	1152	1	2	0.0						1.0	53.4	43.1	2.4	0.2						
	Ampicillin	1152	≤ 1	≤ 1	6.3							91.0	1.8	0.4	0.2	0.3		**6.3**			
	Cefoxitin	1152	2	4	2.0							10.0	57.4	28.6	1.9	0.1	**0.3**	**1.7**			
	Gentamicin	1152	0.50	0.50	2.4					22.7	68.8	5.7	0.3		0.1	**0.6**	**1.8**				
	Kanamycin	1152	≤ 8	≤ 8	1.5										97.6	0.7	0.3	**0.1**	**1.4**		
	Nalidixic acid	1152	2	4	4.9							0.4	65.5	26.6	1.8	0.7	**0.1**	**4.8**			
	Streptomycin	1152	≤ 32	64	12.8												87.2	**6.4**	**6.3**		
	Trimethoprim-sulphamethoxazole	1152	≤ 0.12	0.25	3.5				80.8	14.2	1.3		0.2		**3.5**						
III	Chloramphenicol	1152	8	8	3.0								0.4	45.4	50.4	0.7	**0.2**	**2.9**			
	Sulfisoxazole	1152	64	> 256	10.7											7.7	41.1	37.9	2.4	0.2	**10.7**
	Tetracycline	1152	≤ 4	> 32	19.5									80.1	0.3	**0.3**	**4.9**	**14.3**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Agri-Food Sector

Table A. 8. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from cattle; *Surveillance of Animal Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	133	≤ 1	16	4.5							62.4	3.8	1.5	11.3	16.5	**1.5**	**3.0**			
	Ceftiofur	133	1	1	4.5					0.8	30.8	58.6	5.3			**4.5**					
	Ceftriaxone	133	≤ 0.25	≤ 0.25	0.0					95.5						3.8	0.8				
	Ciprofloxacin	133	≤ 0.015	≤ 0.015	0.0	94.7	4.5			0.8											
II	Amikacin	133	1	2	0.0						5.3	53.4	36.8	3.8		0.8					
	Ampicillin	133	≤ 1	> 32	32.3							62.4	3.8	0.8	0.8			**32.3**			
	Cefoxitin	133	2	4	4.5							9.8	61.7	19.5	4.5		**3.8**	**0.8**			
	Gentamicin	133	0.50	1	6.0					48.9	37.6	6.8	0.8			**3.8**	**2.3**				
	Kanamycin	133	≤ 8	> 64	23.3										76.7			**0.8**	**22.6**		
	Nalidixic acid	133	4	4	0.0								39.8	56.4	3.8						
	Streptomycin	133	≤ 32	> 64	30.8												69.2	**6.8**	**24.1**		
	Trimethoprim-sulphamethoxazole	133	≤ 0.12	0.50	6.8				59.4	30.1	3.8				**6.8**						
III	Chloramphenicol	133	8	> 32	24.1								3.8	30.1	39.8	2.3	**0.8**	**23.3**			
	Sulfisoxazole	133	32	> 256	33.8											4.5	52.6	9.0			**33.8**
	Tetracycline	133	≤ 4	> 32	32.3									67.7			**4.5**	**27.8**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 9. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from beef cattle; *Abattoir Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	176	4	4	0.0							7.4	33.5	52.8	6.3						
	Ceftiofur	176	0.25	0.50	0.0				7.4	51.1	40.9	0.6									
	Ceftriaxone	176	≤ 0.25	≤ 0.25	0.0					100.0											
	Ciprofloxacin	176	≤ 0.015	≤ 0.015	0.0	97.7	2.3														
II	Amikacin	176	2	2	0.0						1.1	26.7	62.5	8.0	1.7						
	Ampicillin	176	2	4	1.1							19.9	54.0	23.3	1.7			**1.1**			
	Cefoxitin	176	4	8	0.0							3.4	27.3	57.4	10.2	1.7					
	Gentamicin	176	0.50	0.50	0.0					8.5	83.0	8.0	0.6								
	Kanamycin	176	≤ 8	≤ 8	2.8										97.2				**2.8**		
	Nalidixic acid	176	2	4	0.0						0.6	14.2	73.3	10.8		1.1					
	Streptomycin	176	≤ 32	64	14.8												85.2	**8.0**	**6.8**		
	Trimethoprim-sulphamethoxazole	176	≤ 0.12	0.25	0.0				73.9	23.9	2.3										
III	Chloramphenicol	176	8	8	2.8								2.3	42.0	50.0	2.8		**2.8**			
	Sulfisoxazole	176	≤ 16	> 256	15.3											80.7	2.8		1.1		**15.3**
	Tetracycline	176	≤ 4	> 32	37.5									52.8	9.7	**7.4**	**4.0**	**26.1**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 10. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from beef; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Province	n	MIC percentiles MIC 50	MIC 90	% R	Distribution (%) of MICs ≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
	Amoxicillin-clavulanic acid	British Columbia	88	4	8	2.3							9.1	30.7	45.5	11.4	1.1	**1.1**	**1.1**			
		Saskatchewan	134	4	4	0.7							4.5	30.6	59.7	4.5			**0.7**			
		Ontario	185	4	4	1.1							7.0	35.1	48.6	7.0	1.1	**0.5**	**0.5**			
		Québec	126	4	4	0.8							9.5	31.7	54.8	3.2			**0.8**			
		Maritimes	39	4	4	2.6							5.1	38.5	53.8			**2.6**				
	Ceftiofur	British Columbia	88	0.25	0.50	2.3				10.2	43.2	44.3					**2.3**					
		Saskatchewan	134	0.25	0.50	0.7				6.7	47.8	44.8				**0.7**						
		Ontario	185	0.25	0.50	1.1				7.6	55.7	35.7					**1.1**					
		Québec	126	0.25	0.50	0.8				11.1	46.8	40.5	0.8			**0.8**						
I		Maritimes	39	0.25	0.50	2.6				2.6	56.4	35.9	2.6			**2.6**						
	Ceftriaxone	British Columbia	88	≤ 0.25	≤ 0.25	0.0					97.7						2.3					
		Saskatchewan	134	≤ 0.25	≤ 0.25	0.0					99.3					0.7						
		Ontario	185	≤ 0.25	≤ 0.25	0.0					98.4		0.5				1.1					
		Québec	126	≤ 0.25	≤ 0.25	0.8					98.4						0.8			**0.8**		
		Maritimes	39	≤ 0.25	≤ 0.25	0.0					97.4					2.6						
	Ciprofloxacin	British Columbia	88	≤ 0.015	≤ 0.015	0.0	97.7	2.3														
		Saskatchewan	134	≤ 0.015	≤ 0.015	0.0	100.0															
		Ontario	185	≤ 0.015	≤ 0.015	0.0	99.5	0.5														
		Québec	126	≤ 0.015	≤ 0.015	0.0	99.2	0.8														
		Maritimes	39	≤ 0.015	≤ 0.015	0.0	100.0															
	Amikacin	British Columbia	88	2	2	0.0							31.8	62.5	5.7							
		Saskatchewan	134	2	2	0.0							29.1	65.7	5.2							
		Ontario	185	2	2	0.0						0.5	23.2	70.3	5.9							
		Québec	126	2	4	0.0							29.4	57.1	11.1	2.4						
		Maritimes	39	2	2	0.0						5.1	35.9	59.0								
	Ampicillin	British Columbia	88	2	4	5.7							21.6	47.7	23.9		1.1		**5.7**			
		Saskatchewan	134	2	4	0.7							14.9	57.5	26.9				**0.7**			
		Ontario	185	2	4	5.9							18.4	55.7	19.5	0.5			**5.9**			
		Québec	126	2	4	2.4							16.7	56.3	23.0	1.6			**2.4**			
		Maritimes	39	2	4	2.6							12.8	51.3	33.3				**2.6**			
	Cefoxitin	British Columbia	88	4	8	2.3						1.1	5.7	22.7	56.8	9.1	2.3		**2.3**			
		Saskatchewan	134	4	8	0.7							3.7	26.9	59.0	9.7			**0.7**			
		Ontario	185	4	4	1.6							2.7	31.4	56.8	7.6		**0.5**	**1.1**			
		Québec	126	4	4	0.8							7.1	28.6	55.6	7.9			**0.8**			
		Maritimes	39	4	4	2.6							2.6	28.2	61.5	5.1		**2.6**				
	Gentamicin	British Columbia	88	0.50	1	0.0					14.8	71.6	13.6									
		Saskatchewan	134	0.50	0.50	0.0					10.4	80.6	8.2	0.7								
		Ontario	185	0.50	1	1.1					9.2	75.7	13.5	0.5				**1.1**				
		Québec	126	0.50	1	0.0					9.5	69.8	19.8	0.8								
		Maritimes	39	0.50	1	0.0					33.3	56.4	10.3									
II	Kanamycin	British Columbia	88	≤ 8	≤ 8	2.3										97.7				**2.3**		
		Saskatchewan	134	≤ 8	≤ 8	0.7										99.3				**0.7**		
		Ontario	185	≤ 8	≤ 8	1.6										98.4				**1.6**		
		Québec	126	≤ 8	≤ 8	4.8										94.4	0.8			**4.8**		
		Maritimes	39	≤ 8	≤ 8	2.6										97.4				**2.6**		
	Nalidixic acid	British Columbia	88	2	4	0.0							10.2	72.7	17.0							
		Saskatchewan	134	2	2	0.0							4.5	85.8	9.7							
		Ontario	185	2	2	0.0						0.5	9.7	81.6	8.1							
		Québec	126	2	2	0.0							13.5	77.8	8.7							
		Maritimes	39	2	2	0.0							10.3	84.6	5.1							
	Streptomycin	British Columbia	88	≤ 32	≤ 32	9.1												90.9	**5.7**	**3.4**		
		Saskatchewan	134	≤ 32	≤ 32	5.2												94.8	**1.5**	**3.7**		
		Ontario	185	≤ 32	64	11.4												88.6	**5.9**	**5.4**		
		Québec	126	≤ 32	≤ 32	7.1												92.9	**4.0**	**3.2**		
		Maritimes	39	≤ 32	≤ 32	5.1												94.9		**5.1**		
	Trimethoprim-sulphamethoxazole	British Columbia	88	≤ 0.12	0.25	0.0				71.6	28.4											
		Saskatchewan	134	≤ 0.12	0.25	0.7				71.6	24.6	3.0				**0.7**						
		Ontario	185	≤ 0.12	0.25	3.2				65.9	27.6	3.2				**3.2**						
		Québec	126	≤ 0.12	0.25	0.8				75.4	22.2	1.6				**0.8**						
		Maritimes	39	≤ 0.12	0.25	2.6				66.7	28.2		2.6			**2.6**						
	Chloramphenicol	British Columbia	88	8	8	0.0								5.7	35.2	56.8	2.3					
		Saskatchewan	134	4	8	0.7								3.0	48.5	46.3	1.5		**0.7**			
		Ontario	185	8	8	3.2								4.3	44.3	47.0	1.1	**0.5**	**2.7**			
		Québec	126	4	8	0.8								6.3	46.8	41.3	4.8		**0.8**			
		Maritimes	39	4	8	0.0								2.6	53.8	43.6						
	Sulfisoxazole	British Columbia	88	≤ 16	32	9.1											79.5	11.4				**9.1**
		Saskatchewan	134	≤ 16	32	7.5											86.6	6.0				**7.5**
III		Ontario	185	≤ 16	> 256	13.0											81.6	4.9			0.5	**13.0**
		Québec	126	≤ 16	32	7.9											88.9	3.2				**7.9**
		Maritimes	39	≤ 16	32	2.6											87.2	7.7	2.6			**2.6**
	Tetracycline	British Columbia	88	≤ 4	> 32	22.7									70.5	6.8	**2.3**	**3.4**	**17.0**			
		Saskatchewan	134	≤ 4	> 32	20.1									76.1	3.7	**3.7**		**16.4**			
		Ontario	185	≤ 4	> 32	20.5									76.2	3.2	**3.2**	**3.2**	**14.1**			
		Québec	126	≤ 4	> 32	16.7									80.2	3.2	**1.6**	**2.4**	**12.7**			
		Maritimes	39	≤ 4	32	17.9									66.7	15.4		**12.8**	**5.1**			
IV																						

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant. Campylobacter spp. may include some species that are intrinsically resistant to nalidixic acid.

Table A. 11. Distribution of MICs (ug/mL) for specific antimicrobials in *Campylobacter* species from beef cattle; *Abattoir Surveillance*, 2008.

*	Antimicrobial	Species	n	MIC Percentiles		% R	Distribution (%) of MICs												
				MIC 50	MIC 90		≤ 0.016	0.032	0.064	0.125	0.25	0.5	1	2	4	8	16	32	64	> 64
I	Ciprofloxacin	*C. coli*	30	0.125	0.25	3.3				53.3	43.3							**3.3**		
	Ciprofloxacin	*C. jejuni*	93	0.125	0.25	2.2			34.4	50.5	12.9					**1.1**		**1.1**		
	Ciprofloxacin	*Campylobacter* spp.	5	0.25	0.25	0.0				20.0	80.0									
	Telithromycin	*C. coli*	30	2	4	0.0								76.7	23.3					
	Telithromycin	*C. jejuni*	93	1	2	0.0					3.2	25.8	60.2	10.8						
	Telithromycin	*Campylobacter* spp.	5	0.5	4	0.0					40.0	40.0			20.0					
II	Azythromycin	*C. coli*	30	0.125	0.25	0.0				56.7	40.0	3.3								
	Azythromycin	*C. jejuni*	93	0.064	0.064	0.0	3.2	38.7	55.9	2.2										
	Azythromycin	*Campylobacter* spp.	5	0.064	0.5	0.0		20.0	40.0		20.0	20.0								
	Clindamycin	*C. coli*	30	1	1	0.0						33.3	63.3		3.3					
	Clindamycin	*C. jejuni*	93	0.125	0.25	0.0			10.8	50.5	31.2	7.5								
	Clindamycin	*Campylobacter* spp.	5	0.25	0.5	0.0				20.0	60.0	20.0								
	Erythromycin	*C. coli*	30	2	2	0.0							3.3	93.3	3.3					
	Erythromycin	*C. jejuni*	93	0.5	0.5	0.0				3.2	34.4	62.4								
	Erythromycin	*Campylobacter* spp.	5	0.5	1	0.0				20.0	20.0	40.0	20.0							
	Gentamicin	*C. coli*	30	0.5	1	0.0						70.0	30.0							
	Gentamicin	*C. jejuni*	93	1	1	0.0						46.2	52.7	1.1						
	Gentamicin	*Campylobacter* spp.	5	0.25	0.25	0.0				40.0	60.0									
	Nalidixic acid	*C. coli*	30	16	16	3.3										16.7	76.7	3.3		**3.3**
	Nalidixic acid	*C. jejuni*	93	≤ 4	8	2.2									68.8	29.0				**2.2**
	Nalidixic acid	*Campylobacter* spp.	5	64	> 64	60.0												40.0	**20.0**	**40.0**
III	Florfenicol	*C. coli*	30	2	2	0.0							20.0	80.0						
	Florfenicol	*C. jejuni*	93	1	1	0.0						20.4	74.2	5.4						
	Florfenicol	*Campylobacter* spp.	5	1	1	0.0					40.0		60.0							
	Tetracycline	*C. coli*	30	> 64	> 64	86.7							13.3							**86.7**
	Tetracycline	*C. jejuni*	93	64	> 64	60.2				18.3	17.2	4.3						**2.2**	**32.3**	**25.8**
	Tetracycline	*Campylobacter* spp.	5	16	32	60.0					20.0					20.0	**40.0**	**20.0**		
IV																				

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant. Campylobacter spp. may include some species that are intrinsically resistant to nalidixic acid.

Table A. 12. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from chickens; *Abattoir Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	234	≤ 1	32	11.5							82.9	0.9		3.8	0.9	**2.6**	**9.0**			
	Ceftiofur	234	1	> 8	11.5						37.6	49.6	1.3		**0.4**	**11.1**					
	Ceftriaxone	234	≤ 0.25	8	0.0					87.6	0.9				1.7	8.1	1.7				
	Ciprofloxacin	234	≤ 0.015	0.03	0.0	84.6	15.0	0.4													
II	Amikacin	234	1	2	0.0						6.8	52.6	38.5	2.1							
	Ampicillin	234	≤ 1	> 32	16.2							79.9	3.4	0.4				**16.2**			
	Cefoxitin	234	2	32	10.7							22.2	50.9	14.1	0.9	1.3	**6.4**	**4.3**			
	Gentamicin	234	0.50	0.50	0.4					46.6	48.7	3.8		0.4			**0.4**				
	Kanamycin	234	≤ 8	≤ 8	0.4										99.6				**0.4**		
	Nalidixic acid	234	4	4	0.0						0.4	1.3	38.5	56.4	3.4						
	Streptomycin	234	≤ 32	> 64	39.7												60.3	**20.9**	**18.8**		
	Trimethoprim-sulphamethoxazole	234	≤ 0.12	0.25	0.0				87.6	11.1	1.3										
III	Chloramphenicol	234	4	8	0.4								5.1	56.0	38.0	0.4		**0.4**			
	Sulfisoxazole	234	32	64	3.0											14.1	65.0	16.7	1.3		**3.0**
	Tetracycline	234	≤ 4	> 32	41.0									59.0		**0.4**	**2.6**	**38.0**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 13. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from chicken; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Province	n	MIC percentiles		% R	Distribution (%) of MICs													
				MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
	Amoxicillin-clavulanic acid	British Columbia	47	≤ 1	> 32	21.3							68.1	4.3		4.3	2.1	4.3	17.0			
		Saskatchewan	64	≤ 1	≤ 1	4.7							90.6			4.7		1.6	3.1			
		Ontario	139	≤ 1	16	9.4							85.6	0.7		1.4	2.9	1.4	7.9			
		Québec	120	≤ 1	> 32	15.0							78.3	0.8		2.5	3.3	3.3	11.7			
		Maritimes	12	≤ 1	> 32	16.7							83.3						16.7			
	Ceftiofur	British Columbia	47	1	> 8	23.4						19.1	55.3	2.1		2.1	21.3					
		Saskatchewan	64	1	1	4.7						37.5	56.3	1.6			4.7					
		Ontario	139	1	8	10.1					0.7	40.3	48.2	0.7		0.7	9.4					
		Québec	120	1	> 8	15.0						38.3	45.8	0.8			15.0					
I		Maritimes	12	1	> 8	16.7						50.0	33.3				16.7					
	Ceftriaxone	British Columbia	47	≤ 0.25	16	0.0					76.6					6.4	12.8	4.3				
		Saskatchewan	64	≤ 0.25	≤ 0.25	0.0					95.3						3.1	1.6				
		Ontario	139	≤ 0.25	8	0.7					89.9					1.4	6.5	1.4	0.7			
		Québec	120	≤ 0.25	16	0.8					85.0					0.8	8.3	5.0	0.8			
		Maritimes	12	≤ 0.25	16	0.0					83.3						16.7					
	Ciprofloxacin	British Columbia	47	≤ 0.015	≤ 0.015	0.0	95.7	2.1	2.1													
		Saskatchewan	64	≤ 0.015	0.03	0.0	85.9	14.1														
		Ontario	139	≤ 0.015	0.03	0.0	87.1	12.9														
		Québec	120	≤ 0.015	0.03	0.0	82.5	16.7	0.8													
		Maritimes	12	≤ 0.015	≤ 0.015	0.0	100.0															
	Amikacin	British Columbia	47	1	4	0.0							61.7	27.7	10.6							
		Saskatchewan	64	1	2	0.0						14.1	51.6	32.8	1.6							
		Ontario	139	1	2	0.0						11.5	56.8	30.2	0.7	0.7						
		Québec	120	1	2	0.0						10.0	58.3	30.0	1.7							
		Maritimes	12	2	2	0.0							50.0	50.0								
	Ampicillin	British Columbia	47	≤ 1	> 32	27.7							70.2		2.1				27.7			
		Saskatchewan	64	≤ 1	4	9.4							84.4	4.7	1.6				9.4			
		Ontario	139	≤ 1	> 32	13.7							80.6	5.8					13.7			
		Québec	120	≤ 1	> 32	20.8							75.0	3.3	0.8				20.8			
		Maritimes	12	≤ 1	> 32	16.7							83.3						16.7			
	Cefoxitin	British Columbia	47	2	32	21.3							8.5	44.7	19.1	4.3	2.1	14.9	6.4			
		Saskatchewan	64	2	8	4.7							20.3	62.5	6.3	6.3		3.1	1.6			
		Ontario	139	2	16	8.6							18.0	59.7	9.4	2.2	2.2	3.6	5.0			
		Québec	120	2	32	14.2							20.8	51.7	11.7	0.8	0.8	9.2	5.0			
		Maritimes	12	2	32	16.7							50.0	33.3				8.3	8.3			
	Gentamicin	British Columbia	47	≤ 0.25	1	0.0					61.7	27.7	6.4		2.1	2.1						
		Saskatchewan	64	≤ 0.25	0.50	0.0					56.3	42.2	1.6									
		Ontario	139	≤ 0.25	0.50	0.7					62.6	36.0		0.7				0.7				
		Québec	120	≤ 0.25	0.50	1.7					66.7	30.0	1.7				0.8	0.8				
		Maritimes	12	0.50	0.50	8.3					16.7	75.0						8.3				
II	Kanamycin	British Columbia	47	≤ 8	≤ 8	0.0										100.0						
		Saskatchewan	64	≤ 8	≤ 8	3.1										96.9				3.1		
		Ontario	139	≤ 8	≤ 8	0.0										99.3	0.7					
		Québec	120	≤ 8	≤ 8	0.8										98.3	0.8			0.8		
		Maritimes	12	≤ 8	≤ 8	0.0										91.7	8.3					
	Nalidixic acid	British Columbia	47	4	4	0.0							2.1	27.7	66.0	4.3						
		Saskatchewan	64	4	4	0.0								29.7	67.2	3.1						
		Ontario	139	4	4	0.0							1.4	27.3	67.6	3.6						
		Québec	120	4	4	0.0							0.8	36.7	56.7	5.8						
		Maritimes	12	4	4	0.0								25.0	75.0							
	Streptomycin	British Columbia	47	≤ 32	> 64	29.8												70.2	19.1	10.6		
		Saskatchewan	64	≤ 32	> 64	35.9												64.1	14.1	21.9		
		Ontario	139	≤ 32	> 64	32.4												67.6	16.5	15.8		
		Québec	120	≤ 32	> 64	30.8												69.2	16.7	14.2		
		Maritimes	12	≤ 32	64	16.7												83.3	16.7			
	Trimethoprim-sulphamethoxazole	British Columbia	47	≤ 0.12	0.25	0.0				51.1	48.9											
		Saskatchewan	64	≤ 0.12	0.25	0.0				73.4	26.6											
		Ontario	139	≤ 0.12	0.25	0.7				75.5	23.7					0.7						
		Québec	120	≤ 0.12	0.25	0.0				69.2	30.8											
		Maritimes	12	≤ 0.12	≤ 0.12	0.0				100.0												
	Chloramphenicol	British Columbia	47	8	8	2.1								2.1	38.3	55.3	2.1		2.1			
		Saskatchewan	64	8	8	1.6								3.1	39.1	54.7	1.6		1.6			
		Ontario	139	4	8	0.7								6.5	48.2	43.9	0.7		0.7			
		Québec	120	4	8	0.0								2.5	48.3	45.8	3.3					
		Maritimes	12	8	8	0.0									50.0	50.0						
	Sulfisoxazole	British Columbia	47	32	64	6.4											19.1	48.9	23.4	2.1		6.4
		Saskatchewan	64	32	64	4.7											6.3	70.3	18.8			4.7
III		Ontario	139	32	64	2.2											20.1	64.7	12.2	0.7		2.2
		Québec	120	32	64	4.2											24.2	55.0	15.8	0.8		4.2
		Maritimes	12	32	64	8.3												83.3	8.3			8.3
	Tetracycline	British Columbia	47	≤ 4	> 32	29.8									70.2			4.3	25.5			
		Saskatchewan	64	≤ 4	> 32	35.9									64.1			4.7	31.3			
		Ontario	139	≤ 4	> 32	36.0									63.3	0.7		6.5	29.5			
		Québec	120	≤ 4	> 32	35.0									64.2	0.8		0.8	34.2			
		Maritimes	12	≤ 4	≤ 4	8.3									91.7				8.3			
IV																						

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 14. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from chickens; *Surveillance of Animal Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	208	≤ 1	> 32	15.9							78.8			2.9	2.4					
	Ceftiofur	208	1	> 8	16.3					0.5	17.3	64.9	0.5	0.5							
	Ceftriaxone	208	≤ 0.25	16	1.0					83.2			0.5	0.5	0.5	11.5	2.9				
	Ciprofloxacin	208	≤ 0.015	0.03	0.0	88.0	12.0														
II	Amikacin	208	1	2	0.0						7.2	63.5	27.9	1.4							
	Ampicillin	208	≤ 1	> 32	21.2							72.6	6.3								
	Cefoxitin	208	2	32	15.4							8.7	67.3	7.7	0.5	0.5					
	Gentamicin	208	≤ 0.25	0.50	2.4					58.7	36.5	1.9		0.5							
	Kanamycin	208	≤ 8	≤ 8	1.4										98.1	0.5					
	Nalidixic acid	208	4	4	0.0								27.4	72.1	0.5						
	Streptomycin	208	≤ 32	64	16.8												83.2				
	Trimethoprim-sulphamethoxazole	208	≤ 0.12	0.25	0.0				78.4	21.6											
III	Chloramphenicol	208	8	8	1.9									33.7	63.0	1.4					
	Sulfisoxazole	208	32	64	5.3											4.8	72.1	17.3	0.5		
	Tetracycline	208	≤ 4	> 32	18.3									80.8	1.0						
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 15. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from chickens; *Abattoir Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	170	4	32	26.5							1.8	27.6	31.8	10.6	1.8	**17.6**	**8.8**			
	Ceftiofur	170	0.50	8	20.0				2.4	32.9	35.3	4.1	1.8	3.5	**11.8**	**8.2**					
	Ceftriaxone	170	≤ 0.25	16	0.0					70.6	2.4	3.5	0.6	1.8	8.8	8.8	3.5				
	Ciprofloxacin	170	≤ 0.015	≤ 0.015	0.0	94.1	2.4	0.6	2.4	0.6											
II	Amikacin	170	2	4	0.0						1.8	23.5	61.2	11.2	2.4						
	Ampicillin	170	4	> 32	36.5							14.1	32.9	15.3	0.6	0.6		**36.5**			
	Cefoxitin	170	4	> 32	25.9								14.1	45.3	12.4	2.4	**7.6**	**18.2**			
	Gentamicin	170	0.50	8	7.6					10.0	59.4	15.3	1.8	3.5	2.4	**3.5**	**4.1**				
	Kanamycin	170	≤ 8	> 64	20.0										79.4	0.6		**0.6**	**19.4**		
	Nalidixic acid	170	2	4	3.5						1.8	12.4	69.4	12.9			**2.4**	**1.2**			
	Streptomycin	170	≤ 32	> 64	43.5												56.5	**17.6**	**25.9**		
	Trimethoprim-sulphamethoxazole	170	≤ 0.12	> 4	11.8				51.8	26.5	7.6	1.2	1.2		**11.8**						
III	Chloramphenicol	170	4	8	2.9								4.1	47.1	45.3	0.6		**2.9**			
	Sulfisoxazole	170	≤ 16	> 256	40.0											54.7	4.7	0.6			**40.0**
	Tetracycline	170	32	> 32	50.6									48.8	0.6		**4.1**	**46.5**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 16. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from chicken; *Retail Meat Surveillance*, 2003-2008.

	Antimicrobial	Province	n	MIC percentiles		% R	Distribution (%) of MICs														
				MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
	Amoxicillin-clavulanic acid	British Columbia	70	32	> 32	52.9							1.4	12.9	24.3	7.1	1.4	40.0	12.9			
		Saskatchewan	92	4	32	20.7							9.8	19.6	31.5	14.1	4.3	14.1	6.5			
		Ontario	150	4	32	27.3							3.3	24.7	33.3	10.0	1.3	18.0	9.3			
		Québec	131	4	32	22.1							6.1	27.5	32.8	9.9	1.5	15.3	6.9			
		Maritimes	37	4	32	27.0							18.9	21.6	29.7	2.7		24.3	2.7			
	Ceftiofur	British Columbia	70	4	> 8	48.6				1.4	17.1	22.9	4.3		5.7	34.3	14.3					
		Saskatchewan	92	0.50	8	19.6				5.4	33.7	40.2			1.1	18.5	1.1					
		Ontario	150	0.50	> 8	24.0				1.3	29.3	41.3			4.0	12.0	12.0					
		Québec	131	0.50	8	18.3				3.8	33.6	37.4	3.1		3.8	10.7	7.6					
I		Maritimes	37	0.50	8	18.9					40.5	32.4		2.7	5.4	13.5	5.4					
	Ceftriaxone	British Columbia	70	4	16	0.0					41.4	1.4	2.9		5.7	18.6	28.6	1.4				
		Saskatchewan	92	≤ 0.25	8	0.0					79.3				1.1	13.0	6.5					
		Ontario	150	≤ 0.25	16	0.0					71.3	0.7			3.3	8.0	15.3	1.3				
		Québec	131	≤ 0.25	16	0.0					76.3	1.5		0.8	3.1	7.6	9.2	1.5				
		Maritimes	37	≤ 0.25	8	0.0					73.0				8.1	10.8	8.1					
	Ciprofloxacin	British Columbia	70	≤ 0.015	≤ 0.015	0.0	91.4	4.3			4.3											
		Saskatchewan	92	≤ 0.015	≤ 0.015	0.0	92.4	1.1		4.3	2.2											
		Ontario	150	≤ 0.015	≤ 0.015	0.0	95.3	0.7		0.7	3.3											
		Québec	131	≤ 0.015	≤ 0.015	0.8	90.1	0.8		0.8	6.1	1.5				0.8						
		Maritimes	37	≤ 0.015	≤ 0.015	0.0	100.0															
	Amikacin	British Columbia	70	2	4	0.0						2.9	12.9	74.3	10.0							
		Saskatchewan	92	2	4	0.0							28.3	56.5	14.1	1.1						
		Ontario	150	2	4	0.0						0.7	21.3	66.7	11.3							
		Québec	131	2	4	0.0						0.8	18.3	68.7	10.7	1.5						
		Maritimes	37	2	4	0.0							43.2	45.9	8.1	2.7						
	Ampicillin	British Columbia	70	> 32	> 32	62.9							2.9	28.6	5.7				62.9			
		Saskatchewan	92	4	> 32	40.2							18.5	28.3	12.0	1.1			40.2			
		Ontario	150	4	> 32	39.3							8.0	38.0	14.7				39.3			
		Québec	131	2	> 32	32.8							18.3	32.8	16.0				32.8			
		Maritimes	37	2	> 32	29.7							27.0	32.4	10.8			2.7	27.0			
	Cefoxitin	British Columbia	70	32	> 32	54.3								8.6	30.0	7.1		11.4	42.9			
		Saskatchewan	92	4	> 32	20.7							3.3	14.1	46.7	13.0	2.2	4.3	16.3			
		Ontario	150	4	> 32	28.0								13.3	47.3	10.7	0.7	4.7	23.3			
		Québec	131	4	> 32	19.8								16.0	52.7	9.2	2.3	3.8	16.0			
		Maritimes	37	4	> 32	24.3							5.4	18.9	35.1	10.8	5.4	5.4	18.9			
	Gentamicin	British Columbia	70	0.50	1	5.7					7.1	71.4	15.7					5.7				
		Saskatchewan	92	0.50	2	8.7					16.3	56.5	15.2	2.2		1.1	2.2	6.5				
		Ontario	150	0.50	16	12.0					9.3	64.7	12.0			2.0	3.3	8.7				
		Québec	131	0.50	> 16	20.6					5.3	61.8	11.5			0.8	9.2	11.5				
		Maritimes	37	0.50	1	5.4					29.7	51.4	13.5				2.7	2.7				
II	Kanamycin	British Columbia	70	≤ 8	16	7.1										90.0	2.9			7.1		
		Saskatchewan	92	≤ 8	> 64	12.0										84.8	3.3		1.1	10.9		
		Ontario	150	≤ 8	16	9.3										88.7	2.0		0.7	8.7		
		Québec	131	≤ 8	16	6.1										89.3	4.6			6.1		
		Maritimes	37	≤ 8	16	8.1										89.2	2.7			8.1		
	Nalidixic acid	British Columbia	70	2	4	4.3						1.4	14.3	67.1	11.4	1.4			4.3			
		Saskatchewan	92	2	4	6.5						2.2	13.0	70.7	7.6			2.2	4.3			
		Ontario	150	2	4	4.0							10.0	78.7	7.3				4.0			
		Québec	131	2	4	8.4						1.5	15.3	68.7	5.3	0.8		1.5	6.9			
		Maritimes	37	2	2	0.0						2.7	21.6	70.3	5.4							
	Streptomycin	British Columbia	70	≤ 32	> 64	31.4												68.6	10.0	21.4		
		Saskatchewan	92	≤ 32	> 64	29.3												70.7	15.2	14.1		
		Ontario	150	≤ 32	> 64	33.3												66.7	10.7	22.7		
		Québec	131	≤ 32	> 64	38.9												61.1	14.5	24.4		
		Maritimes	37	≤ 32	> 64	29.7												70.3	8.1	21.6		
	Trimethoprim-sulphamethoxazole	British Columbia	70	≤ 0.12	0.50	5.7				58.6	30.0	2.9	1.4	1.4		5.7						
		Saskatchewan	92	≤ 0.12	0.25	3.3				66.3	23.9	5.4	1.1			3.3						
		Ontario	150	≤ 0.12	0.50	6.7				53.3	31.3	6.7	1.3	0.7		6.7						
		Québec	131	0.25	> 4	15.3				44.3	30.5	6.1	3.8		0.8	14.5						
		Maritimes	37	0.25	> 4	16.2				35.1	45.9	2.7			2.7	13.5						
	Chloramphenicol	British Columbia	70	8	16	5.7								1.4	40.0	48.6	4.3		5.7			
		Saskatchewan	92	4	8	3.3								1.1	56.5	37.0	2.2		3.3			
		Ontario	150	4	8	4.7								4.7	50.0	40.0	0.7		4.7			
		Québec	131	4	8	4.6								4.6	51.1	36.6	3.1		4.6			
		Maritimes	37	4	8	8.1								2.7	64.9	24.3			8.1			
	Sulfisoxazole	British Columbia	70	≤ 16	> 256	27.1											65.7	5.7		1.4		27.1
		Saskatchewan	92	≤ 16	> 256	20.7											71.7	5.4	2.2			20.7
III		Ontario	150	≤ 16	> 256	30.7											61.3	8.0				30.7
		Québec	131	≤ 16	> 256	45.0											50.4	4.6				45.0
		Maritimes	37	≤ 16	> 256	29.7											59.5	8.1	2.7			29.7
	Tetracycline	British Columbia	70	≤ 4	> 32	45.7									54.3			1.4	44.3			
		Saskatchewan	92	≤ 4	> 32	47.8									51.1	1.1		5.4	42.4			
		Ontario	150	≤ 4	> 32	40.0									58.7	1.3	1.3	4.7	34.0			
		Québec	131	≤ 4	> 32	45.0									54.2	0.8	1.5	5.3	38.2			
		Maritimes	37	≤ 4	> 32	40.5									59.5		2.7	10.8	27.0			
IV																						

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 17. Distribution of MICs (ug/mL) for specific antimicrobials in *Campylobacter* isolates from chicken; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Species	Province	n	MIC percentiles		% R	Distribution (%) of MICs												
					CMI 50	CMI 90		≤ 0.016	0.032	0.064	0.125	0.25	0.5	1	2	4	8	16	32	64	> 64
	Ciprofloxacin	*C. coli*	British Columbia	6	0.125	16	16.7			16.7	50.0	16.7						**16.7**			
	Ciprofloxacin	*C. coli*	Saskatchewan	3	0.125	0.125	0.0				100.0										
	Ciprofloxacin	*C. coli*	Ontario	16	0.125	0.25	6.3			12.5	43.8	37.5						**6.3**			
	Ciprofloxacin	*C. coli*	Québec	5	0.125	0.25	0.0			40.0	20.0	40.0									
	Ciprofloxacin	*C. coli*	Maritimes	1	0.064	0.064	0.0			100.0											
	Ciprofloxacin	*C. jejuni*	British Columbia	44	0.125	0.25	6.8			43.2	31.8	18.2					**4.5**	**2.3**			
	Ciprofloxacin	*C. jejuni*	Saskatchewan	37	0.125	8	10.8			43.2	35.1	10.8					**10.8**				
	Ciprofloxacin	*C. jejuni*	Ontario	104	0.064	0.25	3.8			53.8	32.7	9.6					**2.9**		**1.0**		
	Ciprofloxacin	*C. jejuni*	Québec	49	0.064	0.25	0.0			65.3	20.4	14.3									
	Ciprofloxacin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Ciprofloxacin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Ciprofloxacin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Ciprofloxacin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Ciprofloxacin	*Campylobacter* spp.	Québec	0	0	0	0.0														
I	Ciprofloxacin	*Campylobacter* spp.	Maritimes	1	0.064	0.064	0.0			100.0											
	Telithromycin	*C. coli*	British Columbia	6	0.5	2	0.0					50.0	33.3		16.7						
	Telithromycin	*C. coli*	Saskatchewan	3	0.25	1	0.0					66.7		33.3							
	Telithromycin	*C. coli*	Ontario	16	4	16	12.5					18.8	6.3	6.3	12.5	43.8		**12.5**			
	Telithromycin	*C. coli*	Québec	5	0.5	1	0.0						60.0	40.0							
	Telithromycin	*C. coli*	Maritimes	1	1	1	0.0							100.0							
	Telithromycin	*C. jejuni*	British Columbia	44	0.5	1	0.0				2.3	13.6	45.5	34.1	4.5						
	Telithromycin	*C. jejuni*	Saskatchewan	37	0.5	1	0.0				5.4	18.9	45.9	24.3	5.4						
	Telithromycin	*C. jejuni*	Ontario	104	0.5	2	2.9					9.6	48.1	28.8	4.8	1.0	4.8	**2.9**			
	Telithromycin	*C. jejuni*	Québec	49	0.5	8	2.0					8.2	57.1	18.4	4.1	2.0	8.2	**2.0**			
	Telithromycin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Telithromycin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Telithromycin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Telithromycin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Telithromycin	*Campylobacter* spp.	Québec	0	0	0	0.0														
	Telithromycin	*Campylobacter* spp.	Maritimes	1	0.5	0.5	0.0						100.0								
	Azythromycin	*C. coli*	British Columbia	6	0.064	0.125	0.0		50.0	33.3	16.7										
	Azythromycin	*C. coli*	Saskatchewan	3	0.064	0.064	0.0		33.3	66.7											
	Azythromycin	*C. coli*	Ontario	16	0.125	> 64	18.8		12.5	31.3	12.5	25.0									**18.8**
	Azythromycin	*C. coli*	Québec	5	0.032	0.064	0.0		80.0	20.0											
	Azythromycin	*C. coli*	Maritimes	1	0.125	0.125	0.0				100.0										
	Azythromycin	*C. jejuni*	British Columbia	44	0.064	0.064	0.0	6.8	34.1	50.0	6.8	2.3									
	Azythromycin	*C. jejuni*	Saskatchewan	37	0.032	0.064	0.0	27.0	32.4	35.1	5.4										
	Azythromycin	*C. jejuni*	Ontario	104	0.064	0.125	6.7	1.9	34.6	48.1	7.7		1.0								**6.7**
	Azythromycin	*C. jejuni*	Québec	49	0.064	> 64	12.2	4.1	30.6	51.0	2.0										**12.2**
	Azythromycin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Azythromycin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Azythromycin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Azythromycin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Azythromycin	*Campylobacter* spp.	Québec	0	0	0	0.0														
II	Azythromycin	*Campylobacter* spp.	Maritimes	1	0.064	0.064	0.0			100.0											
	Clindamycin	*C. coli*	British Columbia	6	0.25	0.5	0.0				33.3	50.0	16.7								
	Clindamycin	*C. coli*	Saskatchewan	3	0.125	0.25	0.0				66.7	33.3									
	Clindamycin	*C. coli*	Ontario	16	0.25	16	12.5				18.8	43.8	6.3	18.8				**12.5**			
	Clindamycin	*C. coli*	Québec	5	0.064	0.25	0.0			60.0	20.0	20.0									
	Clindamycin	*C. coli*	Maritimes	1	0.125	0.125	0.0				100.0										
	Clindamycin	*C. jejuni*	British Columbia	44	0.125	0.25	0.0			22.7	47.7	27.3			2.3						
	Clindamycin	*C. jejuni*	Saskatchewan	37	0.125	0.25	0.0		5.4	32.4	43.2	13.5	5.4								
	Clindamycin	*C. jejuni*	Ontario	104	0.125	0.5	2.9			10.6	59.6	17.3	5.8		1.0	2.9			**2.9**		
	Clindamycin	*C. jejuni*	Québec	49	0.125	4	2.0			14.3	55.1	18.4			2.0	8.2	**2.0**				
	Clindamycin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Clindamycin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Clindamycin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Clindamycin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Clindamycin	*Campylobacter* spp.	Québec	0	0	0	0.0														
	Clindamycin	*Campylobacter* spp.	Maritimes	1	0.125	0.125	0.0				100.0										

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 17. Distribution of MICs (ug/mL) for specific antimicrobials in *Campylobacter* isolates from chicken; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Species	Province	n	MIC percentiles		% R	Distribution (%) of MICs												
					CMI 50	CMI 90		≤ 0.016	0.032	0.064	0.125	0.25	0.5	1	2	4	8	16	32	64	> 64
	Erythromycin	*C. coli*	British Columbia	6	0.25	0.5	0.0					66.7	33.3								
	Erythromycin	*C. coli*	Saskatchewan	3	0.25	0.5	0.0					66.7	33.3								
	Erythromycin	*C. coli*	Ontario	16	2	> 64	18.8					12.5	18.8	12.5	31.3	6.3			6.3		12.5
	Erythromycin	*C. coli*	Québec	5	0.25	0.5	0.0				20.0	40.0	40.0								
	Erythromycin	*C. coli*	Maritimes	1	0.5	0.5	0.0						100.0								
	Erythromycin	*C. jejuni*	British Columbia	44	0.25	1	0.0			4.5	9.1	45.5	29.5	9.1	2.3						
	Erythromycin	*C. jejuni*	Saskatchewan	37	0.25	0.5	0.0			2.7	21.6	51.4	24.3								
	Erythromycin	*C. jejuni*	Ontario	104	0.25	1	6.7				5.8	54.8	23.1	6.7	1.9	1.0					6.7
	Erythromycin	*C. jejuni*	Québec	49	0.5	> 64	12.2				10.2	36.7	38.8	2.0						2.0	10.2
	Erythromycin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Erythromycin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Erythromycin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Erythromycin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Erythromycin	*Campylobacter* spp.	Québec	0	0	0	0.0														
	Erythromycin	*Campylobacter* spp.	Maritimes	1	0.25	0.25	0.0					100.0									
	Gentamicin	*C. coli*	British Columbia	6	0.5	1	0.0					33.3	33.3	33.3							
	Gentamicin	*C. coli*	Saskatchewan	3	1	1	0.0							100.0							
	Gentamicin	*C. coli*	Ontario	16	0.5	2	6.3						62.5	25.0	6.3					6.3	
	Gentamicin	*C. coli*	Québec	5	0.5	0.5	0.0						100.0								
	Gentamicin	*C. coli*	Maritimes	1	0.5	0.5	0.0						100.0								
	Gentamicin	*C. jejuni*	British Columbia	44	0.5	1	0.0					4.5	75.0	20.5							
	Gentamicin	*C. jejuni*	Saskatchewan	37	0.5	1	0.0					2.7	67.6	29.7							
II	Gentamicin	*C. jejuni*	Ontario	104	0.5	1	0.0					1.9	67.3	30.8							
	Gentamicin	*C. jejuni*	Québec	49	0.5	1	0.0					2.0	87.8	10.2							
	Gentamicin	*C. jejuni*	Maritimes	0	0	0	0.0														
	Gentamicin	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Gentamicin	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Gentamicin	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Gentamicin	*Campylobacter* spp.	Québec	0	0	0	0.0														
	Gentamicin	*Campylobacter* spp.	Maritimes	1	0.5	0.5	0.0						100.0								
	Nalidixic acid	*C. coli*	British Columbia	6	8	> 64	16.7									33.3	50.0				16.7
	Nalidixic acid	*C. coli*	Saskatchewan	3	≤ 4	≤ 4	0.0									100.0					
	Nalidixic acid	*C. coli*	Ontario	16	8	16	6.3									43.8	43.8	6.3			6.3
	Nalidixic acid	*C. coli*	Québec	5	≤ 4	8	0.0									80.0	20.0				
	Nalidixic acid	*C. coli*	Maritimes	1	≤ 4	≤ 4	0.0									100.0					
	Nalidixic acid	*C. jejuni*	British Columbia	44	≤ 4	8	6.8									70.5	20.5	2.3			6.8
	Nalidixic acid	*C. jejuni*	Saskatchewan	37	≤ 4	> 64	10.8									78.4	10.8				10.8
	Nalidixic acid	*C. jejuni*	Ontario	104	≤ 4	8	3.8									88.5	7.7				3.8
	Nalidixic acid	*C. jejuni*	Québec	49	≤ 4	8	0.0									81.6	18.4				
	Nalidixic acid	*C. jejuni*	Maritimes	0	0	0	0.0														
	Nalidixic acid	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Nalidixic acid	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Nalidixic acid	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Nalidixic acid	*Campylobacter* spp.	Québec	0	0	0	0.0														
	Nalidixic acid	*Campylobacter* spp.	Maritimes	1	≤ 4	≤ 4	0.0									100.0					
	Florfenicol	*C. coli*	British Columbia	6	1	1	0.0							100.0							
	Florfenicol	*C. coli*	Saskatchewan	3	1	1	0.0							100.0							
	Florfenicol	*C. coli*	Ontario	16	1	2	0.0							68.8	31.3						
	Florfenicol	*C. coli*	Québec	5	1	1	0.0						20.0	80.0							
	Florfenicol	*C. coli*	Maritimes	1	1	1	0.0							100.0							
	Florfenicol	*C. jejuni*	British Columbia	44	1	2	0.0						4.5	84.1	11.4						
	Florfenicol	*C. jejuni*	Saskatchewan	37	1	1	0.0						27.0	70.3	2.7						
	Florfenicol	*C. jejuni*	Ontario	104	1	1	0.0						15.4	79.8	3.8	1.0					
	Florfenicol	*C. jejuni*	Québec	49	1	1	0.0						12.2	83.7	4.1						
	Florfenicol	*C. jejuni*	Maritimes	0	0	0	0.0														
	Florfenicol	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Florfenicol	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Florfenicol	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Florfenicol	*Campylobacter* spp.	Québec	0	0	0	0.0														
III	Florfenicol	*Campylobacter* spp.	Maritimes	1	0.5	0.5	0.0						100.0								
	Tetracycline	*C. coli*	British Columbia	6	8	> 64	33.3					33.3		16.7			16.7			16.7	16.7
	Tetracycline	*C. coli*	Saskatchewan	3	0.25	0.25	0.0				33.3	66.7									
	Tetracycline	*C. coli*	Ontario	16	1	> 64	43.8				12.5	12.5	18.8	12.5					6.3		37.5
	Tetracycline	*C. coli*	Québec	5	0.5	64	20.0						80.0							20.0	
	Tetracycline	*C. coli*	Maritimes	1	> 64	> 64	100.0														100.0
	Tetracycline	*C. jejuni*	British Columbia	44	0.25	> 64	31.8			2.3	25.0	25.0	9.1		2.3	2.3	2.3		2.3	11.4	18.2
	Tetracycline	*C. jejuni*	Saskatchewan	37	8	> 64	48.6				16.2	32.4					2.7		24.3	5.4	18.9
	Tetracycline	*C. jejuni*	Ontario	104	32	> 64	50.0			1.9	23.1	18.3	6.7						4.8	18.3	26.9
	Tetracycline	*C. jejuni*	Québec	49	64	> 64	59.2				24.5	12.2	2.0	2.0					2.0	32.7	24.5
	Tetracycline	*C. jejuni*	Maritimes	0	0	0	0.0														
	Tetracycline	*Campylobacter* spp.	British Columbia	0	0	0	0.0														
	Tetracycline	*Campylobacter* spp.	Saskatchewan	0	0	0	0.0														
	Tetracycline	*Campylobacter* spp.	Maritimes	0	0	0	0.0														
	Tetracycline	*Campylobacter* spp.	Ontario	0	0	0	0.0														
	Tetracycline	*Campylobacter* spp.	Québec	1	0.125	0.125	0.0				100.0										
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 18. Distribution of MICs (ug/mL) for specific antimicrobials in *Enterococcus* isolates from chicken; *Retail Meat Surveillance*, 2008.

Antimicrobial	Species	Province	n	MIC 50	MIC 90	% R	Distribution (%) of MICs ≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	> 2048
Ciprofloxacin	*E. faecalis*	British Columbia	70	1	2	0.0						4.3	74.3	21.4											
		Saskatchewan	85	1	2	1.2						1.2	80.0	17.6	1.2										
		Ontario	148	1	2	1.4						2.7	75.0	20.9	0.7	0.7									
		Québec	133	1	2	0.0						1.5	80.5	18.0											
		Maritimes	17	1	2	0.0							70.6	29.4											
	E. faecium	British Columbia	3	1	2	0.0						33.3	33.3	33.3											
		Saskatchewan	1	2	2	0.0								100.0											
		Ontario	3	4	4	66.7								33.3	66.7										
		Québec	5	1	> 4	20.0							60.0	20.0		20.0									
		Maritimes	1	1	1	0.0							100.0												
	Enterococcus spp.	British Columbia	4	1	1	0.0						25.0	75.0												
		Saskatchewan	5	0.25	2	0.0					60.0		20.0	20.0											
		Ontario	3	0.5	2	0.0					33.3	33.3		33.3											
		Québec	4	0.5	1	0.0					50.0	25.0	25.0												
		Maritimes	0	0	0	0.0																			
Daptomycin	*E. faecalis*	British Columbia	70	1	1	0.0						25.7	71.4	2.9											
		Saskatchewan	85	1	1	0.0						24.7	74.1	1.2											
		Ontario	148	1	1	0.0						36.5	62.2	1.4											
		Québec	133	1	1	0.0						27.8	70.7	1.5											
		Maritimes	17	1	2	0.0						23.5	58.8	17.6											
	E. faecium	British Columbia	3	2	2	0.0								100.0											
		Saskatchewan	1	4	4	0.0									100.0										
		Ontario	3	2	4	0.0								66.7	33.3										
		Québec	5	2	4	0.0							20.0	60.0	20.0										
		Maritimes	1	2	2	0.0								100.0											
	Enterococcus spp.	British Columbia	4	2	2	0.0						25.0		75.0											
		Saskatchewan	5	2	4	0.0						20.0		60.0	20.0										
		Ontario	3	≤ 0.5	≤ 0.5	0.0						100.0													
		Québec	4	1	2	0.0						50.0	25.0	25.0											
		Maritimes	0	0	0	0.0																			
Linezolid	*E. faecalis*	British Columbia	70	2	2	0.0							21.4	78.6											
		Saskatchewan	85	2	2	0.0							29.4	70.6											
		Ontario	148	2	2	0.0							16.2	83.8											
		Québec	133	2	2	0.0							22.6	77.4											
I		Maritimes	17	2	2	0.0							17.6	82.4											
	E. faecium	British Columbia	3	2	2	0.0							33.3	66.7											
		Saskatchewan	1	1	1	0.0							100.0												
		Ontario	3	1	2	0.0							66.7	33.3											
		Québec	5	2	2	0.0							40.0	60.0											
		Maritimes	1	2	2	0.0								100.0											
	Enterococcus spp.	British Columbia	4	2	2	0.0							25.0	75.0											
		Saskatchewan	5	2	2	0.0							20.0	80.0											
		Ontario	3	2	2	0.0						33.3		66.7											
		Québec	4	1	1	0.0							100.0												
		Maritimes	0	0	0	0.0																			
Quinupristin-dalfopristin[a]	*E. faecium*	British Columbia	3	2	8	33.3							33.3	33.3		33.3									
		Saskatchewan	1	16	16	100.0											100.0								
		Ontario	3	16	16	100.0									33.3		66.7								
		Québec	5	16	32	80.0								20.0			40.0	40.0							
		Maritimes	1	32	32	100.0												100.0							
	Enterococcus spp.	British Columbia	4	8	8	50.0							25.0	25.0		50.0									
		Saskatchewan	5	8	8	80.0								20.0		80.0									
		Ontario	3	2	2	0.0								100.0											
		Québec	4	16	16	100.0									25.0	25.0	50.0								
		Maritimes	0	0	0	0.0																			
Tigecycline	*E. faecalis*	British Columbia	70	0.12	0.25	0.0			14.3	58.6	27.1														
		Saskatchewan	85	0.12	0.25	0.0			4.7	57.6	36.5	1.2													
		Ontario	148	0.12	0.25	0.0			5.4	62.2	31.1	1.4													
		Québec	133	0.12	0.25	0.8			6.8	55.6	35.3	1.5	0.8												
		Maritimes	17	0.25	0.25	0.0				11.8	88.2														
	E. faecium	British Columbia	3	0.12	0.12	0.0			33.3	66.7															
		Saskatchewan	1	0.12	0.12	0.0				100.0															
		Ontario	3	0.12	0.12	0.0			33.3	66.7															
		Québec	5	0.12	0.5	0.0			20.0	40.0	20.0	20.0													
		Maritimes	1	0.25	0.25	0.0					100.0														
	Enterococcus spp.	British Columbia	4	0.12	0.12	0.0			25.0	75.0															
		Saskatchewan	5	0.25	0.5	0.0			20.0	20.0	20.0	40.0													
		Ontario	3	0.12	0.12	0.0				100.0															
		Québec	4	0.12	0.12	0.0			50.0	50.0															
		Maritimes	0	0	0	0.0																			

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

[a] Resistance to quinupristin-dalfopristin and lincomycin is not reported for *E.* faecalis because *E.* faecalis is intrinsically resistant to these antimicrobials.

Table A. 18. Distribution of MICs (ug/mL) for specific antimicrobials in *Enterococcus* isolates from chicken; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Species	Province	n	MIC 50	MIC 90	% R	≤ 0.015	0,03	0,06	0,12	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024	2048	> 2048
I	Vancomycin	*E. faecalis*	British Columbia	70	1	2	0.0							65.7	34.3											
			Saskatchewan	85	1	2	0.0							61.2	38.8											
			Ontario	148	1	2	0.0						0.7	62.8	35.1	1.4										
			Québec	133	1	2	0.0						0.8	57.9	40.6	0.8										
			Maritimes	17	1	2	0.0							70.6	29.4											
		E. faecium	British Columbia	3	≤ 0.5	1	0.0						66.7	33.3												
			Saskatchewan	1	≤ 0.5	≤ 0.5	0.0						100.0													
			Ontario	3	≤ 0.5	≤ 0.5	0.0						100.0													
			Québec	5	≤ 0.5	2	0.0						80.0		20.0											
			Maritimes	1	2	2	0.0								100.0											
		Enterococcus spp.	British Columbia	4	1	8	0.0						50.0	25.0			25.0									
			Saskatchewan	5	1	1	0.0						40.0	60.0												
			Ontario	3	1	4	0.0						33.3	33.3		33.3										
			Québec	4	1	2	0.0						50.0	25.0	25.0											
			Maritimes	0	0	0	0.0																			
	Erythromycin	*E. faecalis*	British Columbia	70	> 8	> 8	54.3						18.6	12.9	14.3			**54.3**								
			Saskatchewan	85	> 8	> 8	69.4						20.0	5.9	4.7			**69.4**								
			Ontario	148	4	> 8	49.3						31.1	12.2	6.8	0.7	**2.0**	**47.3**								
			Québec	133	> 8	> 8	54.9						29.3	12.0	3.8			**54.9**								
			Maritimes	17	2	> 8	41.2						23.5	5.9	29.4			**41.2**								
		E. faecium	British Columbia	3	2	> 8	33.3						33.3		33.3			**33.3**								
			Saskatchewan	1	> 8	> 8	100.0											**100.0**								
			Ontario	3	> 8	> 8	100.0											**100.0**								
			Québec	5	> 8	> 8	80.0									20.0		**80.0**								
			Maritimes	1	2	2	0.0								100.0											
		Enterococcus spp.	British Columbia	4	1	4	0.0						50.0	25.0		25.0										
			Saskatchewan	5	2	> 8	20.0						40.0		20.0	20.0		**20.0**								
			Ontario	3	≤ 0.5	> 8	33.3						66.7					**33.3**								
			Québec	4	> 8	> 8	100.0											**100.0**								
			Maritimes	0	0	0	0.0																			
	Gentamicin	*E. faecalis*	British Columbia	70	≤ 128	≤ 128	4.3														95.7		**2.9**	**1.4**		
			Saskatchewan	85	≤ 128	≤ 128	3.5														96.5					**3.5**
			Ontario	148	≤ 128	≤ 128	4.7														95.3		**0.7**	**0.7**		**3.4**
			Québec	133	≤ 128	512	10.5														87.2	2.3	**6.8**			**3.8**
			Maritimes	17	≤ 128	1024	17.6														82.4			**11.8**		**5.9**
		E. faecium	British Columbia	3	≤ 128	≤ 128	0.0														100.0					
			Saskatchewan	1	≤ 128	≤ 128	0.0														100.0					
			Ontario	3	≤ 128	≤ 128	0.0														100.0					
			Québec	5	≤ 128	≤ 128	0.0														100.0					
			Maritimes	1	≤ 128	≤ 128	0.0														100.0					
		Enterococcus spp.	British Columbia	4	≤ 128	≤ 128	0.0														100.0					
			Saskatchewan	5	≤ 128	≤ 128	0.0														100.0					
			Ontario	3	≤ 128	≤ 128	0.0														100.0					
			Québec	4	≤ 128	≤ 128	0.0														100.0					
			Maritimes	0	0	0	0.0																			
	Kanamycin	*E. faecalis*	British Columbia	70	≤ 128	> 1024	20.0														78.6		1.4	**2.9**		**17.1**
			Saskatchewan	85	≤ 128	> 1024	24.7														74.1		1.2	**2.4**		**22.4**
			Ontario	148	≤ 128	> 1024	15.5														83.8		0.7			**15.5**
			Québec	133	≤ 128	> 1024	21.8														77.4		0.8	**0.8**		**21.1**
			Maritimes	17	≤ 128	> 1024	29.4														70.6					**29.4**
II		*E. faecium*	British Columbia	3	256	> 1024	33.3															66.7				**33.3**
			Saskatchewan	1	256	256	0.0															100.0				
			Ontario	3	256	256	0.0														33.3	66.7				
			Québec	5	≤ 128	256	0.0														60.0	40.0				
			Maritimes	1	≤ 128	≤ 128	0.0														100.0					
		Enterococcus spp.	British Columbia	4	≤ 128	≤ 128	0.0														100.0					
			Saskatchewan	5	≤ 128	256	0.0														80.0	20.0				
			Ontario	3	≤ 128	≤ 128	0.0														100.0					
			Québec	4	≤ 128	≤ 128	0.0														100.0					
			Maritimes	0	0	0	0.0																			
	Lincomycin[a]	*E. faecium*	British Columbia	3	> 32	> 32	100.0											**33.3**		**66.7**						
			Saskatchewan	1	> 32	> 32	100.0													**100.0**						
			Ontario	3	> 32	> 32	100.0													**100.0**						
			Québec	5	> 32	> 32	100.0										**20.0**			**80.0**						
			Maritimes	1	> 32	> 32	100.0													**100.0**						
		Enterococcus spp.	British Columbia	4	> 32	> 32	100.0												**50.0**	**50.0**						
			Saskatchewan	5	> 32	> 32	100.0											**20.0**		**80.0**						
			Ontario	3	16	> 32	100.0											**66.7**		**33.3**						
			Québec	4	> 32	> 32	100.0													**100.0**						
			Maritimes	0	0	0	0.0																			
	Penicillin	*E. faecalis*	British Columbia	70	4	4	0.0								28.6	71.4										
			Saskatchewan	85	4	4	0.0								40.0	60.0										
			Ontario	148	4	4	0.0								33.8	66.2										
			Québec	133	4	4	0.0								24.1	75.9										
			Maritimes	17	4	4	0.0								23.5	76.5										
		E. faecium	British Columbia	3	2	> 16	33.3								66.7				**33.3**							
			Saskatchewan	1	16	16	100.0											**100.0**								
			Ontario	3	16	16	66.7										33.3	**66.7**								
			Québec	5	8	16	40.0						20.0		20.0		20.0	**40.0**								
			Maritimes	1	2	2	0.0								100.0											
		Enterococcus spp.	British Columbia	4	4	> 16	25.0							25.0	25.0	25.0			**25.0**							
			Saskatchewan	5	2	16	20.0						20.0	20.0	20.0	20.0		**20.0**								
			Ontario	3	≤ 0.5	1	0.0						66.7	33.3												
			Québec	4	1	2	0.0						50.0	25.0	25.0											
			Maritimes	0	0	0	0.0																			

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

[a] Resistance to quinupristin-dalfopristin and lincomycin is not reported for *E.* faecalis because *E.* faecalis is intrinsically resistant to these antimicrobials.

Table A. 18. Distribution of MICs (ug/mL) for specific antimicrobials in Enterococcus isolates *from* chicken; Retail Meat *Surveillance, 2008.*

	Antimicrobial	Species	Province	n	MIC percentile		% R	Distribution (%) of MICs																		
					MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	> 2048
	Streptomycin	*E. faecalis*	British Columbia	70	≤ 512	> 2048	41.4																58.6	1.4	5.7	34.3
			Saskatchewan	85	≤ 512	> 2048	40.0																60.0		5.9	34.1
			Ontario	148	≤ 512	> 2048	28.4																71.6	2.7	4.7	20.9
			Québec	133	≤ 512	> 2048	39.1																60.9	3.8	9.0	26.3
			Maritimes	17	≤ 512	2048	17.6																82.4		17.6	
		E. faecium	British Columbia	3	≤ 512	> 2048	33.3																66.7			33.3
			Saskatchewan	1	1024	1024	100.0																	100.0		
			Ontario	3	≤ 512	≤ 512	0.0																100.0			
			Québec	5	≤ 512	≤ 512	0.0																100.0			
			Maritimes	1	2048	2048	100.0																		100.0	
		Enterococcus spp.	British Columbia	4	≤ 512	≤ 512	0.0																100.0			
			Saskatchewan	5	≤ 512	2048	20.0																80.0		20.0	
			Ontario	3	≤ 512	≤ 512	0.0																100.0			
			Québec	4	≤ 512	1024	25.0																75.0	25.0		
			Maritimes	0	0	0	0.0																			
II	Tylosin	*E. faecalis*	British Columbia	70	> 32	> 32	52.9							10.0	35.7			1.4		52.9						
			Saskatchewan	85	> 32	> 32	69.4							5.9	24.7					69.4						
			Ontario	148	> 32	> 32	50.0						0.7	5.4	43.2	0.7				50.0						
			Québec	133	> 32	> 32	54.1							6.0	38.3	0.8	0.8			54.1						
			Maritimes	17	2	> 32	41.2							29.4	29.4					41.2						
		E. faecium	British Columbia	3	4	> 32	33.3									66.7				33.3						
			Saskatchewan	1	> 32	> 32	100.0													100.0						
			Ontario	3	> 32	> 32	100.0													100.0						
			Québec	5	> 32	> 32	80.0									20.0				80.0						
			Maritimes	1	1	1	0.0							100.0												
		Enterococcus spp.	British Columbia	4	1	2	0.0							75.0	25.0											
			Saskatchewan	5	2	> 32	20.0							20.0	60.0					20.0						
			Ontario	3	2	> 32	33.3							33.3	33.3					33.3						
			Québec	4	> 32	> 32	100.0													100.0						
			Maritimes	0	0	0	0.0																			
	Chloramphenicol	*E. faecalis*	British Columbia	70	8	8	0.0									21.4	78.6									
			Saskatchewan	85	8	8	0.0									10.6	88.2	1.2								
			Ontario	148	8	8	0.7									16.9	81.1	1.4	0.7							
			Québec	133	8	8	6.0									21.1	72.9		0.8	5.3						
			Maritimes	17	8	8	0.0									11.8	88.2									
		E. faecium	British Columbia	3	4	4	0.0									100.0										
			Saskatchewan	1	4	4	0.0									100.0										
			Ontario	3	4	8	0.0									66.7	33.3									
			Québec	5	4	8	0.0									80.0	20.0									
			Maritimes	1	4	4	0.0									100.0										
		Enterococcus spp.	British Columbia	4	4	8	0.0								25.0	50.0	25.0									
			Saskatchewan	5	4	4	0.0									100.0										
			Ontario	3	4	4	0.0									100.0										
			Québec	4	8	8	0.0									50.0	50.0									
			Maritimes	0	0	0	0.0																			
	Nitrofurantoin	*E. faecalis*	British Columbia	70	8	16	0.0										55.7	41.4	2.9							
			Saskatchewan	85	8	16	0.0										55.3	42.4		2.4						
			Ontario	148	8	16	0.0										56.1	35.8	4.1	4.1						
			Québec	133	8	16	0.0										60.9	32.3	3.8	3.0						
			Maritimes	17	8	64	0.0										64.7	23.5		11.8						
		E. faecium	British Columbia	3	64	> 64	33.3													66.7	33.3					
			Saskatchewan	1	> 64	> 64	100.0														100.0					
III			Ontario	3	> 64	> 64	66.7													33.3	66.7					
			Québec	5	64	> 64	20.0												20.0	60.0	20.0					
			Maritimes	1	64	64	0.0													100.0						
		Enterococcus spp.	British Columbia	4	> 64	> 64	50.0										25.0	25.0			50.0					
			Saskatchewan	5	> 64	> 64	60.0												20.0	20.0	60.0					
			Ontario	3	16	32	0.0										33.3	33.3	33.3							
			Québec	4	> 64	> 64	75.0												25.0		75.0					
			Maritimes	0	0	0	0.0																			
	Tetracycline	*E. faecalis*	British Columbia	70	> 32	> 32	75.7									22.9	1.4		8.6	67.1						
			Saskatchewan	85	> 32	> 32	85.9									14.1			7.1	78.8						
			Ontario	148	> 32	> 32	89.2									10.8		0.7	8.8	79.7						
			Québec	133	> 32	> 32	86.5									13.5		0.8	6.8	78.9						
			Maritimes	17	> 32	> 32	76.5									23.5			23.5	52.9						
		E. faecium	British Columbia	3	32	> 32	66.7									33.3			33.3	33.3						
			Saskatchewan	1	> 32	> 32	100.0													100.0						
			Ontario	3	> 32	> 32	100.0													100.0						
			Québec	5	> 32	> 32	80.0									20.0			20.0	60.0						
			Maritimes	1	> 32	> 32	100.0													100.0						
			British Columbia	4	32	> 32	75.0									25.0			50.0	25.0						
			Saskatchewan	5	> 32	> 32	80.0									20.0			20.0	60.0						
			Ontario	3	≤ 4	≤ 4	0.0									100.0										
			Québec	4	> 32	> 32	100.0												50.0	50.0						
			Maritimes	0	0	0	0.0																			
	Flavomycin	*E. faecalis*	British Columbia	70	≤ 1	≤ 1	0.0							100.0												
			Saskatchewan	85	≤ 1	≤ 1	0.0							100.0												
			Ontario	148	≤ 1	≤ 1	0.7							96.6	2.0		0.7		0.7							
			Québec	133	≤ 1	≤ 1	0.8							95.5	3.0	0.8			0.8							
			Maritimes	17	≤ 1	≤ 1	0.0							100.0												
		E. faecium	British Columbia	3	16	> 16	33.3								33.3			33.3	33.3							
			Saskatchewan	1	2	2	0.0								100.0											
IV			Ontario	3	4	8	0.0								33.3	33.3	33.3									
			Québec	5	16	> 16	40.0									40.0		20.0	40.0							
			Maritimes	1	> 16	> 16	100.0												100.0							
		Enterococcus spp.	British Columbia	4	> 16	> 16	50.0							25.0			25.0		50.0							
			Saskatchewan	5	4	> 16	40.0								20.0	40.0			40.0							
			Ontario	3	8	> 16	33.3								33.3		33.3		33.3							
			Québec	4	> 16	> 16	50.0							50.0					50.0							
			Maritimes	0	0	0	0.0																			

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Table A. 19. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from pigs; *Farm Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	61	≤ 1	8	0.0							62.3	6.6		23.0	8.2					
	Ceftiofur	61	1	1	0.0						27.9	68.9	3.3								
	Ceftriaxone	61	≤ 0.25	≤ 0.25	0.0					100.0											
	Ciprofloxacin	61	≤ 0.015	≤ 0.015	0.0	90.2	8.2	1.6													
II	Amikacin	61	1	2	0.0							50.8	44.3	4.9							
	Ampicillin	61	≤ 1	> 32	32.8							60.7	3.3	3.3							
	Cefoxitin	61	2	4	0.0							4.9	49.2	42.6	3.3						
	Gentamicin	61	0.50	1	1.6					37.7	47.5	11.5	1.6								
	Kanamycin	61	≤ 8	> 64	21.3										78.7						
	Nalidixic acid	61	4	4	0.0								36.1	60.7	3.3						
	Streptomycin	61	≤ 32	> 64	36.1												63.9				
	Trimethoprim-sulphamethoxazole	61	≤ 0.12	0.25	3.3				55.7	39.3	1.6										
III	Chloramphenicol	61	8	> 32	24.6									23.0	50.8	1.6					
	Sulfisoxazole	61	64	> 256	39.3											6.6	27.9	24.6	1.6		
	Tetracycline	61	32	> 32	57.4									42.6							
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 20. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from pigs; *Abattoir Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	151	≤ 1	16	1.3							66.9	5.3	2.0	13.2	11.3	**1.3**				
	Ceftiofur	151	1	1	0.7					0.7	17.9	74.8	6.0			**0.7**					
	Ceftriaxone	151	≤ 0.25	≤ 0.25	0.0					99.3						0.7					
	Ciprofloxacin	151	≤ 0.015	0.03	0.0	76.2	21.2	2.6													
II	Amikacin	151	1	2	0.0						2.0	49.0	45.7	3.3							
	Ampicillin	151	≤ 1	> 32	27.8							57.0	12.6	2.0	0.7			**27.8**			
	Cefoxitin	151	2	8	0.7							6.6	48.3	34.4	8.6	1.3		**0.7**			
	Gentamicin	151	0.50	1	0.7					35.8	52.3	10.6	0.7				**0.7**				
	Kanamycin	151	≤ 8	16	9.9										89.4	0.7			**9.9**		
	Nalidixic acid	151	4	4	0.0								18.5	75.5	6.0						
	Streptomycin	151	≤ 32	> 64	44.4												55.6	**10.6**	**33.8**		
	Trimethoprim-sulphamethoxazole	151	≤ 0.12	0.50	6.6				52.3	30.5	7.9	1.3	1.3	**0.7**	**6.0**						
III	Chloramphenicol	151	8	> 32	23.2									15.2	56.3	5.3		**23.2**			
	Sulfisoxazole	151	64	> 256	46.4											7.9	28.5	17.2			**46.4**
	Tetracycline	151	32	> 32	57.6									42.4		**1.3**	**17.9**	**38.4**			
IV																					

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Table A. 21. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from pigs; *Surveillance of Animal Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	155	2	16	1.3							48.4	5.8	2.6	11.0	31.0	**0.6**	**0.6**			
	Ceftiofur	155	1	1	1.3						7.7	87.1	3.9			**1.3**					
	Ceftriaxone	155	≤ 0.25	≤ 0.25	0.0					98.7						0.6	0.6				
	Ciprofloxacin	155	≤ 0.015	≤ 0.015	0.0	94.8	5.2														
II	Amikacin	155	1	2	0.0						1.3	56.8	38.7	2.6	0.6						
	Ampicillin	155	2	> 32	45.8							45.2	5.8	2.6		0.6	**0.6**	**45.2**			
	Cefoxitin	155	2	4	1.9							3.2	54.2	36.1	3.9	0.6	**0.6**	**1.3**			
	Gentamicin	155	0.50	1	1.9					36.1	51.0	10.3			0.6	**0.6**	**1.3**				
	Kanamycin	155	≤ 8	> 64	18.1										81.3	0.6			**18.1**		
	Nalidixic acid	155	4	4	0.0								36.1	60.6	3.2						
	Streptomycin	155	64	> 64	56.8												43.2	**23.9**	**32.9**		
	Trimethoprim-sulphamethoxazole	155	0.25	2	9.7				48.4	36.1	5.2		0.6		**9.7**						
III	Chloramphenicol	155	8	> 32	35.5									9.0	51.0	4.5		**35.5**			
	Sulfisoxazole	155	> 256	> 256	59.4											4.5	33.5	2.6			**59.4**
	Tetracycline	155	32	> 32	66.5									32.3	1.3	**0.6**	**16.8**	**49.0**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 22. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from pigs; *Farm Surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	1425	4	8	1.2							3.2	27.9	39.4	26.9	1.3	**1.0**	**0.2**			
	Ceftiofur	1425	0.25	0.50	1.1				3.9	52.7	41.5	0.6		0.2	**0.6**	**0.4**					
	Ceftriaxone	1425	≤ 0.25	≤ 0.25	0.0					98.7	0.1			0.2	0.7	0.3	0.1				
	Ciprofloxacin	1425	≤ 0.015	≤ 0.015	0.0	97.9	1.7	0.2	0.1	0.1											
II	Amikacin	1425	2	4	0.0						1.3	30.2	56.6	10.6	1.2	0.1					
	Ampicillin	1425	2	> 32	34.0							9.3	40.8	14.5	1.1	0.3	**0.3**	**33.8**			
	Cefoxitin	1425	4	8	1.3						0.4	1.2	24.3	62.3	9.9	0.6	**0.4**	**0.8**			
	Gentamicin	1425	0.50	1	1.0					18.4	63.3	15.7	1.1	0.1	0.4	**0.4**	**0.6**				
	Kanamycin	1425	≤ 8	> 64	14.5										84.8	0.3	0.4	**0.8**	**13.8**		
	Nalidixic acid	1425	2	4	0.4						0.5	12.4	76.6	10.2			**0.1**	**0.2**			
	Streptomycin	1425	≤ 32	> 64	34.4												65.6	**16.1**	**18.2**		
	Trimethoprim-sulphamethoxazole	1425	0.25	> 4	10.0				45.3	33.8	9.4	1.3	0.1		**10.0**						
III	Chloramphenicol	1425	8	> 32	18.9								2.5	32.9	40.4	5.3	**8.6**	**10.3**			
	Sulfisoxazole	1425	32	> 256	47.9											48.1	3.6	0.3	0.2		**47.9**
	Tetracycline	1425	> 32	> 32	79.4									20.4	0.2	**0.9**	**4.5**	**74.0**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 23. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from pigs; *Abattoir surveillance*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
	Amoxicillin-clavulanic acid	150	4	8	0.7							2.0	22.7	42.7	30.0	2.0	**0.7**				
	Ceftiofur	150	0.25	0.50	0.7				4.0	48.7	46.0	0.7			**0.7**						
I	Ceftriaxone	150	≤ 0.25	≤ 0.25	0.0					98.7	0.7					0.7					
	Ciprofloxacin	150	≤ 0.015	≤ 0.015	0.0	99.3				0.7											
	Amikacin	150	2	4	0.0						2.0	27.3	54.0	15.3	1.3						
	Ampicillin	150	4	> 32	33.3							5.3	42.7	17.3	1.3			**33.3**			
	Cefoxitin	150	4	8	0.0							1.3	23.3	63.3	10.7	1.3					
II	Gentamicin	150	0.50	1	2.0					12.0	67.3	17.3		1.3		**2.0**					
	Kanamycin	150	≤ 8	> 64	18.7										81.3			**0.7**	**18.0**		
	Nalidixic acid	150	2	4	0.7						1.3	8.7	79.3	10.0				**0.7**			
	Streptomycin	150	≤ 32	> 64	35.3												64.7	**18.0**	**17.3**		
	Trimethoprim-sulphamethoxazole	150	0.25	> 4	13.3				32.0	34.0	16.7	3.3	0.7		**13.3**						
	Chloramphenicol	150	8	32	24.7								1.3	28.0	42.0	4.0	**16.7**	**8.0**			
III	Sulfisoxazole	150	> 256	> 256	52.0											46.0	2.0				**52.0**
	Tetracycline	150	> 32	> 32	84.7									15.3		**0.7**	**4.0**	**80.0**			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 24. Distribution of MICs (ug/mL) for specific antimicrobials in *E. coli* isolates from pork; *Retail Meat Surveillance*, 2008.

	Antimicrobial	Province	n	MIC percentiles		% R	Distribution (%) of MICs														
				MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
	Amoxicillin-clavulanic acid	British Columbia	44	4	8	6.8							4.5	15.9	52.3	20.5		2.3	4.5			
		Saskatchewan	42	4	8	9.5							2.4	28.6	54.8	4.8		4.8	4.8			
		Ontario	155	4	8	0.6							1.9	30.3	54.2	12.3	0.6	0.6				
		Québec	60	4	8	3.3							3.3	36.7	40.0	16.7		1.7	1.7			
		Maritimes	17	4	8	0.0							5.9	29.4	41.2	23.5						
	Ceftiofur	British Columbia	44	0.25	0.50	6.8				6.8	47.7	36.4	2.3			4.5	2.3					
		Saskatchewan	42	0.25	0.50	7.1				2.4	50.0	40.5				4.8	2.4					
		Ontario	155	0.25	0.50	0.6				4.5	54.2	40.0	0.6			0.6						
		Québec	60	0.25	0.50	3.3				8.3	53.3	33.3	1.7			1.7	1.7					
I		Maritimes	17	0.25	0.50	0.0				5.9	70.6	23.5										
	Ceftriaxone	British Columbia	44	≤ 0.25	≤ 0.25	0.0					93.2					2.3	4.5					
		Saskatchewan	42	≤ 0.25	≤ 0.25	0.0					92.9					2.4	2.4	2.4				
		Ontario	155	≤ 0.25	≤ 0.25	0.6					98.7					0.6				0.6		
		Québec	60	≤ 0.25	≤ 0.25	0.0					96.7					1.7		1.7				
		Maritimes	17	≤ 0.25	≤ 0.25	0.0					100.0											
	Ciprofloxacin	British Columbia	44	≤ 0.015	≤ 0.015	0.0	100.0															
		Saskatchewan	42	≤ 0.015	≤ 0.015	0.0	97.6				2.4											
		Ontario	155	≤ 0.015	≤ 0.015	0.0	99.4	0.6														
		Québec	60	≤ 0.015	≤ 0.015	1.7	95.0			1.7	1.7					1.7						
		Maritimes	17	≤ 0.015	≤ 0.015	0.0	100.0															
	Amikacin	British Columbia	44	2	4	0.0							20.5	56.8	22.7							
		Saskatchewan	42	2	4	0.0						2.4	16.7	50.0	28.6	2.4						
		Ontario	155	2	4	0.0							14.8	70.3	14.2	0.6						
		Québec	60	2	4	0.0							21.7	56.7	21.7							
		Maritimes	17	2	2	0.0							29.4	64.7	5.9							
	Ampicillin	British Columbia	44	2	> 32	22.7							13.6	40.9	22.7				22.7			
		Saskatchewan	42	2	32	11.9							11.9	50.0	26.2			2.4	9.5			
		Ontario	155	2	> 32	16.8							11.6	43.9	26.5	1.3			16.8			
		Québec	60	2	> 32	18.3							13.3	56.7	10.0	1.7			18.3			
		Maritimes	17	2	> 32	17.6							11.8	47.1	23.5				17.6			
	Cefoxitin	British Columbia	44	4	8	6.8								27.3	45.5	18.2	2.3		6.8			
		Saskatchewan	42	4	8	9.5							2.4	16.7	59.5	11.9		2.4	7.1			
		Ontario	155	4	8	0.6							0.6	23.2	60.0	12.9	2.6		0.6			
		Québec	60	4	8	3.3							3.3	28.3	51.7	13.3		1.7	1.7			
		Maritimes	17	4	4	0.0							5.9	29.4	58.8	5.9						
	Gentamicin	British Columbia	44	0.50	1	4.5					9.1	65.9	20.5				2.3	2.3				
		Saskatchewan	42	0.50	1	2.4					9.5	61.9	26.2					2.4				
		Ontario	155	0.50	1	3.2					3.9	72.3	20.0			0.6	1.9	1.3				
		Québec	60	0.50	1	1.7					6.7	70.0	18.3	3.3				1.7				
		Maritimes	17	0.50	1	0.0					17.6	70.6	11.8									
II	Kanamycin	British Columbia	44	≤ 8	≤ 8	2.3										95.5	2.3			2.3		
		Saskatchewan	42	≤ 8	≤ 8	2.4										95.2	2.4			2.4		
		Ontario	155	≤ 8	≤ 8	3.2										96.1	0.6			3.2		
		Québec	60	≤ 8	≤ 8	1.7										96.7	1.7			1.7		
		Maritimes	17	≤ 8	> 64	11.8										88.2				11.8		
	Nalidixic acid	British Columbia	44	2	2	0.0							18.2	72.7	9.1							
		Saskatchewan	42	2	2	2.4							19.0	76.2	2.4				2.4			
		Ontario	155	2	2	0.0							11.6	81.3	7.1							
		Québec	60	2	4	5.0						1.7	16.7	70.0	6.7				5.0			
		Maritimes	17	2	2	0.0							11.8	82.4	5.9							
	Streptomycin	British Columbia	44	≤ 32	> 64	22.7												77.3	11.4	11.4		
		Saskatchewan	42	≤ 32	64	14.3												85.7	9.5	4.8		
		Ontario	155	≤ 32	64	14.2												85.8	5.8	8.4		
		Québec	60	≤ 32	64	13.3												86.7	8.3	5.0		
		Maritimes	17	≤ 32	64	11.8												88.2	11.8			
	Trimethoprim-sulphamethoxazole	British Columbia	44	≤ 0.12	0.50	6.8				56.8	31.8	2.3	2.3			6.8						
		Saskatchewan	42	≤ 0.12	0.25	0.0				54.8	40.5	2.4	2.4									
		Ontario	155	≤ 0.12	0.50	7.1				56.8	27.7	6.5	1.9			7.1						
		Québec	60	≤ 0.12	> 4	10.0				58.3	25.0	6.7				10.0						
		Maritimes	17	0.25	> 4	11.8				35.3	47.1		5.9			11.8						
	Chloramphenicol	British Columbia	44	8	8	4.5								4.5	43.2	47.7		2.3	2.3			
		Saskatchewan	42	8	8	0.0								4.8	40.5	50.0	4.8					
		Ontario	155	4	8	9.0								3.9	50.3	36.1	0.6	3.9	5.2			
		Québec	60	4	16	6.7								6.7	50.0	33.3	3.3	3.3	3.3			
		Maritimes	17	8	8	5.9									41.2	52.9			5.9			
	Sulfisoxazole	British Columbia	44	≤ 16	> 256	27.3											72.7					27.3
		Saskatchewan	42	≤ 16	> 256	11.9											81.0	7.1				11.9
III		Ontario	155	≤ 16	> 256	20.6											72.9	6.5				20.6
		Québec	60	≤ 16	> 256	23.3											65.0	11.7				23.3
		Maritimes	17	≤ 16	> 256	17.6											76.5		5.9			17.6
	Tetracycline	British Columbia	44	≤ 4	> 32	45.5									54.5		4.5	4.5	36.4			
		Saskatchewan	42	≤ 4	> 32	28.6									71.4		2.4		26.2			
		Ontario	155	≤ 4	> 32	38.1									61.9		0.6	0.6	36.8			
		Québec	60	≤ 4	> 32	35.0									65.0			3.3	31.7			
		Maritimes	17	≤ 4	> 32	41.2									58.8			5.9	35.3			
IV																						

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 25. Distribution of MICs (ug/mL) for specific antimicrobials in *Enterococcus* species from pigs; *Farm Surveillance*, 2008.

	Antimicrobial	Species	n	MIC percentile		% R	Distribution (%) of MICs																		
				MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	> 2048
	Ciprofloxacin	*E. faecalis*	918	1	2	0.2					0.1	2.8	70.2	26.7		0.2									
	Ciprofloxacin	*E. faecium*	60	2	4	33.3						3.3	31.7	31.7	26.7	6.7									
	Ciprofloxacin	*Enterococcus* spp.	288	0.5	1	1.0					14.2	60.4	17.4	6.9	0.7	0.3									
	Daptomycin	*E. faecalis*	918	1	1	0.1						20.2	75.3	4.4	0.1		0.1								
	Daptomycin	*E. faecium*	60	2	4	0.0						10.0	10.0	38.3	41.7										
	Daptomycin	*Enterococcus* spp.	288	1	4	0.0						19.4	39.2	30.6	10.8										
	Linezolid	*E. faecalis*	918	2	2	0.0						2.6	24.8	72.4	0.1										
	Linezolid	*E. faecium*	60	2	2	0.0							6.7	93.3											
I	Linezolid	*Enterococcus* spp.	288	2	2	0.0						5.6	39.9	54.5											
	Quinupristin-dalfopristin[a]	*E. faecium*	60	2	4	11.7							30.0	58.3	10.0	1.7									
	Quinupristin-dalfopristin	*Enterococcus* spp.	288	4	8	51.7							6.9	41.3	21.9	27.4	2.4								
	Tigecycline	*E. faecalis*	918	0.25	0.25	1.6	0.3	1.2	3.2	37.6	50.1	6.0	1.6												
	Tigecycline	*E. faecium*	60	0.12	0.5	1.7			1.7	50.0	35.0	11.7	1.7												
	Tigecycline	*Enterococcus* spp.	288	0.12	0.25	2.1		2.1	13.2	52.8	25.0	4.9	2.1												
	Vancomycin	*E. faecalis*	918	1	2	0.0						0.7	80.0	19.1	0.3										
	Vancomycin	*E. faecium*	60	0.5	2	0.0						66.7	16.7	13.3	3.3										
	Vancomycin	*Enterococcus* spp.	288	0.5	2	0.0						65.3	21.5	4.9	4.9	3.5									
	Erythromycin	*E. faecalis*	918	16	16	77.8						5.7	13.0	3.4	0.2	0.9	76.9								
	Erythromycin	*E. faecium*	60	2	16	13.3						26.7	11.7	31.7	16.7	3.3	10.0								
	Erythromycin	*Enterococcus* spp.	288	16	16	65.6						32.6	1.4	0.3		1.7	63.9								
	Gentamicin	*E. faecalis*	918	128	256	8.9														89.8	2.2	4.4	2.1	1.6	
	Gentamicin	*E. faecium*	60	128	128	0.0														100.0					
	Gentamicin	*Enterococcus* spp.	288	128	128	1.7														96.9	1.4		1.0	0.7	
	Kanamycin	*E. faecalis*	918	128	2048	34.0														65.0	0.7	0.3	0.1	33.9	
	Kanamycin	*E. faecium*	60	128	512	8.3														60.0	18.3	13.3		8.3	
	Kanamycine	*Enterococcus* spp.	288	128	2048	23.3														75.3	0.7	0.7	0.3	22.9	
II	Lincomycin[a]	*E. faecium*	60	16	64	88.3							8.3		3.3	6.7	35.0	13.3	33.3						
	Lincomycin	*Enterococcus* spp.	288	64	64	97.6							0.7	1.7			7.3	11.5	78.8						
	Penicillin	*E. faecalis*	918	4	4	0.0						0.4	0.2	20.5	78.2	0.7									
	Penicillin	*E. faecium*	60	2	8	3.3						8.3	15.0	30.0	36.7	6.7	3.3								
	Penicillin	*Enterococcus* spp.	288	1	16	11.8						43.4	21.9	4.9	11.1	6.9	5.2	6.6							
	Streptomycin	*E. faecalis*	918	512	> 2048	47.2																52.8	3.9	13.8	29,4
	Streptomycin	*E. faecium*	60	512	512	8.3																91.7	6.7		1,7
	Streptomycin	*Enterococcus* spp.	288	512	> 2048	28.8																71.2	7.6	8.7	12,5
	Tylosin	*E. faecalis*	918	64	64	78.0					0.1		8.4	13.1		0.4		0.1	77.9						
	Tylosin	*E. faecium*	60	4	64	10.0							25.0	20.0	33.3	11.7			10.0						
	Tylosin	*Enterococcus* spp.	288	64	64	66.3					0.3	0.3	6.6	22.6	3.5		0.3	0.3	66.0						
	Chloramphenicol	*E. faecalis*	918	8	8	7.4							0.1	0.4	10.3	79.5	2.2	2.5	4.9						
	Chloramphenicol	*E. faecium*	60	4	8	0.0								1.7	70.0	26.7	1.7								
	Chloramphenicol	*Enterococcus* spp.	288	4	8	5.9								5.2	56.9	31.6	0.3	3.5	2.4						
	Nitrofurantoin	*E. faecalis*	918	8	16	0.9								0.1	1.2	74.8	21.2	0.4	1.3	0.9					
III	Nitrofurantoin	*E. faecium*	60	64	64	6.7											13.3	1.7	78.3	6.7					
	Nitrofurantoin	*Enterococcus* spp.	288	32	128	18.8								0.3	2.4	17.7	6.9	35.8	18.1	18.8					
	Tetracycline	*E. faecalis*	918	64	64	93.8									6.0	0.2	1.3	3.9	88.6						
	Tetracycline	*E. faecium*	60	4	64	40.0									60.0			3.3	36.7						
	Tetracycline	*Enterococcus* spp.	288	64	64	83.3									16.0	0.7	1.7	3.5	78.1						
	Flavomycin	*E. faecalis*	918	1	1	0.4							93.4	6.2				0.4							
IV	Flavomycin	*E. faecium*	60	32	32	93.3								3.3		1.7	1.7	93.3							
	Flavomycin	*Enterococcus* spp.	288	16	32	47.9							17.4	9.4	9.0	8.7	7.3	48.3							

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

[a] Resistance to quinupristin-dalfopristin and lincomycin is not reported for *E*. faecalis because *E*. faecalis is intrinsically resistant to these antimicrobials.

Table A. 26. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from turkeys; *Surveillance of Animal Clinical Isolates*, 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	32	> 32	> 32	56.3							43.8					3.1	53.1			
	Ceftiofur	32	> 8	> 8	56.3						15.6	25.0	3.1			56.3					
	Ceftriaxone	32	16	32	9.4					43.8						15.6	31.3	6.3	3.1		
	Ciprofloxacin	32	≤ 0.015	≤ 0.015	0.0	96.9		3.1													
II	Amikacin	32	2	2	0.0						3.1	46.9	40.6	9.4							
	Ampicillin	32	> 32	> 32	56.3							40.6	3.1					56.3			
	Cefoxitin	32	32	> 32	56.3						3.1	6.3	25.0	6.3	3.1		9.4	46.9			
	Gentamicin	32	0.50	> 16	28.1					18.8	46.9	3.1	3.1				28.1				
	Kanamycin	32	≤ 8	> 64	15.6										78.1	3.1	3.1		15.6		
	Nalidixic acid	32	4	4	0.0								21.9	75.0	3.1						
	Streptomycin	32	≤ 32	> 64	40.6												59.4	9.4	31.3		
	Trimethoprim-sulphamethoxazole	32	≤ 0.12	0.25	3.1				68.8	28.1					3.1						
III	Chloramphenicol	32	8	8	3.1									31.3	65.6			3.1			
	Sulfisoxazole	32	32	> 256	31.3											21.9	37.5	9.4			31.3
	Tetracycline	32	≤ 4	> 32	43.8									56.3				43.8			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Table A. 27. Distribution of MICs (ug/mL) for specific antimicrobials in *Salmonella* isolates from horses; *Surveillance of Animal Clinical Isolates,* 2008.

	Antimicrobial	n	MIC Percentiles		% R	Distribution (%) of MICs														
			MIC 50	MIC 90		≤ 0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	> 256
I	Amoxicillin-clavulanic acid	62	8	32	11.3							46.8	1.6		12.9	27.4	1.6	9.7			
	Ceftiofur	62	1	> 8	11.3						32.3	56.5				11.3					
	Ceftriaxone	62	≤ 0.25	16	0.0					88.7						9.7	1.6				
	Ciprofloxacin	62	≤ 0.015	0.25	0.0	58.1	1.6			40.3											
II	Amikacin	62	1	16	0.0						1.6	50.0	12.9	1.6	4.8	21.0	8.1				
	Ampicillin	62	> 32	> 32	51.6							46.8	1.6					51.6			
	Cefoxitin	62	2	32	11.3							35.5	41.9	11.3			8.1	3.2			
	Gentamicin	62	0.50	> 16	41.9					33.9	22.6	1.6					41.9				
	Kanamycin	62	≤ 8	> 64	41.9										58.1				41.9		
	Nalidixic acid	62	4	16	0.0								14.5	45.2	27.4	12.9					
	Streptomycin	62	≤ 32	≤ 32	4.8												95.2	3.2	1.6		
	Trimethoprim-sulphamethoxazole	62	0.25	> 4	41.9				43.5	14.5					41.9						
III	Chloramphenicol	62	8	> 32	16.1									27.4	56.5			16.1			
	Sulfisoxazole	62	64	> 256	41.9											8.1	30.6	19.4			41.9
	Tetracycline	62	≤ 4	≤ 4	3.2									93.5	3.2			3.2			
IV																					

Roman numerals I to IV indicate the ranking of human medicine importance as outlined by the Veterinary Drugs Directorate. The unshaded fields indicate the range tested for each antimicrobial in the plate configuration. Bold red numbers indicate the percentage of isolates that were resistant to the antimicrobial according to the predefined resistance breakpoint. Numbers to the right of the highest concentration in the tested range (i.e. bold red numbers in shaded fields) represent the percentage of isolates with growth in all wells within the tested range, indicating that the actual MICs were greater than the tested range of concentrations. Numbers at the lowest concentration in the tested range (i.e. blue numbers at the left in unshaded fields) represent the percentage of isolates susceptible to the antimicrobial at the indicated or lower concentrations. Solid bars represent resistance breakpoints. Dotted bars represent susceptibility breakpoints. MIC 50 = MIC at which 50% of isolates were inhibited. MIC 90 = MIC at which 90% of isolates were inhibited. %R = Percentage of isolates that were resistant.

Recovery Rates

Table A. 28. Recovery rates by surveillance component, animal species, and year; 2002–2008.

CIPARS Component/ Animal species	Province	Year	% Isolates recovered / Number of isolates recovered/number of samples submitted							
			Escherichia coli		*Salmonella*		*Campylobacter*		*Enterococcus*	
Farm Surveillance										
Pigs		2006	**99%**	459/462	**20%**	94/462			**81%**	374/462
		2007	**100%**	612/612	**21%**	136/612			**81%**	495/612
		2008	**99%**	481/486	**13%**	61/486			**92%**	448/486
Abattoir Surveillance										
Beef cattle		2002	**97%**	76/78	**1%**	3/78				
		2003	**97%**	155/159	**< 1 %**	1/114				
		2004	**98%**	167/170						
		2005	**97%**	122/126			**66%**	23/35		
		2006	**100%**	150/150			**36%**	31/87		
		2007	**99%**	188/190			**39%**	75/190		
		2008	**97%**	176/182			**68%**[b]	115/168		
Pigs		2002	**97%**	38/39	**27%**	103/385				
		2003	**98%**	153/155	**28%**	395/1393				
		2004	**99%**	142/143	**38%**	270/703				
		2005	**99%**	163/164	**42%**	212/486				
		2006	**98%**	115/117	**40%**	145/359				
		2007	**98%**	93/95	**36%**	105/296				
		2008	**100%**	147/147	**44%**	151/340				
Chickens		2002	**100%**	40/40	**13%**	25/195				
		2003	**97%**	150/153	**16%**	126/803				
		2004	**99%**	130/131	**16%**	142/893				
		2005	**99%**	218/220	**18%**	200/1103				
		2006	**100%**	166/166	**23%**	187/824				
		2007	**99%**	180/181	**25%**	204/808				
		2008	**99%**	170/171	**28%**	234/851				
Retail Meat Surveillance										
Beef	British Columbia	2005	**93%**	27/29						
		2007	**79%**	49/62						
		2008	**77%**	88/115						
	Saskatchewan	2005	**79%**	120/151						
		2006	**76%**	123/161						
		2007	**78%**	118/151						
		2008	**76%**	134/177						
	Ontario	2003	**66%**	101/154	**2%**	2/84	**3%**	2/76	**91%**	69/76
		2004	**80%**	190/237						
		2005	**81%**	184/227						
		2006	**81%**	189/235						
		2007	**71%**	184/227						
		2008	**78%**	185/236						
	Québec	2003	**57%**	84/147	**0%**	0/33	**0%**	0/33	**80%**	28/35
		2004	**56%**	137/245						
		2005	**56%**	126/225						
		2006	**50%**	109/215						
		2007	**68%**	147/216						
		2008	**59%**	126/214						
	Maritimes	2004	**67%**	16/24						
		2007	**52%**	16/31						
		2008	**70%**	39/56						

The number of isolates recovered may differ from the final number of isolates tested for antimicrobial susceptibility.
[a] Enhancement to *Salmonella* recovery method explains higher prevalence in 2007 in retail chicken isolates.
[b] Implementation of a new *Campylobacter* recovery method in 2008 in abattoir beef cattle isolates.

Table A. 28. Recovery rates by surveillance component, animal species, and year; 2002–2008.

CIPARS Component/ Animal species	Province	Year	% Isolates recovered / Number of isolates recovered/number of samples submitted							
			Escherichia coli		*Salmonella*		*Campylobacter*		*Enterococcus*	
Retail Meat Surveillance										
Pork	British Columbia	2005	**31%**	10/32						
		2007	**29%**	23/79	**1%**	1/79				
		2008	**30%**	44/148	**2%**	3/148				
	Saskatchewan	2005	**30%**	48/162						
		2006	**30%**	49/165	**2%**	3/134				
		2007	**25%**	38/154	**2%**	3/154				
		2008	**23%**	41/176	**< 1%**	1/176				
	Ontario	2003	**58%**	90/154	**1%**	1/93	**0%**	0/76	**87%**	66/76
		2004	**71%**	198/279						
		2005	**59%**	179/303						
		2006	**59%**	182/311	**< 1%**	1/255				
		2007	**54%**	172/320	**2%**	6/319				
		2008	**50%**	155/312	**2%**	7/310				
	Québec	2003	**42%**	61/147	**3%**	1/32	**9%**	3/32	**82%**	28/34
		2004	**38%**	109/290						
		2005	**26%**	79/300						
		2006	**20%**	57/287	**0%**	0/232				
		2007	**22%**	64/287	**1%**	3/288				
		2008	**21%**	60/287	**2%**	5/286				
	Maritimes	2004	**58%**	14/24						
		2007	**39%**	13/31	**3%**	1/30				
		2008	**30%**	17/56	**2%**	1/56				
Chicken	British Columbia	2005	**95%**	19/20	**13%**	5/39	**69%**	27/39	**100%**	20/20
		2007	**98%**	42/43	**22%**[a]	18/81	**35%**	28/80	**100%**	34/34
		2008	**90%**	70/78	**32%**	47/145	**34%**	50/145	**100%**	78/78
	Saskatchewan	2005	**98%**	81/83	**14%**	21/153	**37%**	53/145	**98%**	83/85
		2006	**98%**	85/86	**16%**	25/153	**33%**	51/155	**98%**	85/87
		2007	**97%**	75/77	**31%**[a]	43/141	**35%**	49/141	**100%**	77/77
		2008	**99%**	91/92	**40%**	64/161	**25%**	41/161	**100%**	92/92
	Ontario	2003	**95%**	137/144	**16%**	27/167	**47%**	78/166	**99%**	143/144
		2004	**95%**	150/158	**17%**	54/315	**45%**	143/315	**100%**	158/158
		2005	**95%**	145/153	**9%**	26/303	**40%**	120/303	**99%**	150/152
		2006	**97%**	152/156	**12%**	36/311	**34%**	104/311	**98%**	154/156
		2007	**98%**	157/161	**54%**[a]	172/320	**37%**	117/320	**100%**	161/161
		2008	**96%**	150/156	**45%**	139/311	**39%**	121/311	**99%**	154/156
	Québec	2003	**89%**	112/126	**16%**	29/171	**55%**	94/170	**100%**	125/125
		2004	**96%**	157/161	**17%**	53/320	**50%**	161/322	**100%**	161/161
		2005	**95%**	142/149	**9%**	26/300	**34%**	103/299	**100%**	150/150
		2006	**94%**	135//144	**12%**	33/288	**35%**	100/288	**100%**	144/144
		2007	**90%**	129/144	**40%**[a]	113/287	**21%**	59/287	**99%**	143/144
		2008	**91%**	131/144	**42%**	120/287	**19%**	54/287	**100%**	144/144
	Maritimes	2004	**100%**	13/13	**4%**	1/25	**40%**	10/25	**100%**	13/13
		2007	**91%**	29/32	**22%**[a]	7/32	**3%**	1/32	**48%**	12/25
		2008	**68%**	38/56	**23%**	13/56	**4%**	2/56	**38%**	21/56

The number of isolates recovered may differ from the final number of isolates tested for antimicrobial susceptibility.
[a] Enhancement to *Salmonella* recovery method explains higher prevalence in 2007 in retail chicken isolates.
[b] Implementation of a new *Campylobacter* recovery method in 2008 in abattoir beef cattle isolates.