

Table 4A. Antimicrobial Resistance among *Salmonella* by Animal Source, 1997-2008

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Number of Isolates Tested	Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	
	Turkey	107	240	713	518	550	244	262	236	227	304	271	148	
	Cattle	24	284	1610	1388	893	1008	670	607	329	389	439	443	
	Swine	111	793	876	451	418	379	211	308	301	304	211	111	
Antimicrobial Class	Antimicrobial	Isolate Source												
Aminoglycosides	Amikacin	Chicken	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.5% 1	0.0% 0
	Gentamicin	Chicken	17.8% 38	15.3% 86	10.4% 150	14.9% 175	7.9% 103	5.5% 83	6.3% 73	4.9% 63	4.3% 85	5.7% 79	4.5% 45	5.6% 35
		Turkey	20.6% 22	18.3% 44	17.5% 125	16.2% 84	20.9% 115	19.3% 47	21.0% 55	25.4% 60	22.9% 52	16.4% 50	12.9% 35	16.9% 25
		Cattle	0.0% 0	1.8% 5	1.6% 25	2.1% 29	2.1% 19	2.6% 26	2.7% 18	1.8% 11	2.4% 8	3.9% 15	1.6% 7	1.6% 7
		Swine	0.9% 1	0.8% 6	1.1% 10	1.3% 6	1.4% 6	0.8% 3	0.5% 1	1.3% 4	2.7% 8	2.0% 6	0.9% 2	2.7% 3
	Kanamycin	Chicken	2.3% 5	3.2% 18	1.2% 17	4.1% 48	2.4% 31	2.0% 30	2.8% 32	2.7% 34	2.5% 49	3.6% 49	3.4% 34	3.4% 21
		Turkey	24.3% 26	17.1% 41	21.5% 153	21.4% 111	22.9% 126	24.2% 59	16.0% 42	14.4% 34	19.8% 45	10.5% 32	16.2% 44	14.2% 21
		Cattle	8.3% 2	9.5% 27	7.1% 115	6.6% 92	6.9% 62	10.1% 102	13.7% 92	8.9% 54	13.1% 43	9.5% 37	7.7% 34	9.9% 44
		Swine	11.7% 13	7.2% 57	6.7% 59	9.3% 42	6.9% 29	4.2% 16	5.7% 12	3.9% 12	5.0% 15	8.6% 26	7.1% 15	3.6% 4
	Streptomycin	Chicken	24.3% 52	27.8% 156	27.5% 396	28.6% 335	21.0% 275	22.9% 343	19.6% 227	22.2% 284	23.3% 464	21.2% 293	19.3% 192	25.2% 157
		Turkey	34.6% 37	40.8% 98	43.6% 311	41.9% 217	46.7% 257	37.7% 92	29.4% 77	33.9% 80	40.1% 91	28.9% 88	34.7% 94	32.4% 48
		Cattle	12.5% 3	16.2% 46	15.4% 248	21.3% 296	20.3% 181	25.9% 261	28.7% 192	20.9% 127	24.3% 80	23.7% 92	19.8% 87	23.0% 102
		Swine	27.9% 31	29.4% 233	29.3% 257	39.2% 177	35.6% 149	40.1% 152	30.8% 65	36.4% 112	36.5% 110	26.3% 80	27.0% 57	29.7% 33
β -Lactam/ β -Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	Chicken	0.5% 1	2.0% 11	4.9% 70	7.3% 86	4.5% 59	10.2% 153	9.7% 112	12.4% 159	12.1% 241	12.9% 178	15.6% 155	8.7% 54
		Turkey	4.7% 5	0.4% 1	4.3% 31	3.5% 18	6.9% 38	3.7% 9	1.5% 4	4.7% 11	3.5% 8	5.6% 17	11.1% 30	5.4% 8
		Cattle	8.3% 2	2.5% 7	3.9% 62	9.9% 138	11.8% 105	17.7% 178	21.0% 141	13.5% 82	21.0% 69	18.5% 72	15.5% 68	16.5% 73
		Swine	0.0% 0	0.4% 3	1.0% 9	1.8% 8	2.6% 11	3.7% 14	3.8% 8	1.9% 6	4.3% 13	2.3% 7	3.3% 7	4.5% 5

Table 4A (continued). Resistance among *Salmonella* by Animal Source, 1997-2008

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008		
Number of Isolates Tested	Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624		
	Turkey	107	240	713	518	550	244	262	236	227	304	271	148		
	Cattle	24	284	1610	1388	893	1008	670	607	329	389	439	443		
	Swine	111	793	876	451	418	379	211	308	301	304	211	111		
Antimicrobial Class	Antimicrobial	Isolate Source													
Cephems	Cefoxitin	Chicken	Not Tested	Not Tested	Not Tested	7.2% 85	4.1% 53	8.7% 130	8.2% 95	12.4% 159	12.0% 238	12.8% 176	13.0% 129	8.0% 50	
		Turkey	Not Tested	Not Tested	Not Tested	3.3% 17	4.5% 25	2.5% 6	1.1% 3	5.1% 12	3.5% 8	5.3% 16	9.2% 25	5.4% 8	
		Cattle	Not Tested	Not Tested	Not Tested	9.1% 126	11.1% 99	15.9% 160	17.8% 119	13.2% 80	19.8% 65	17.7% 69	15.0% 66	14.7% 65	
		Swine	Not Tested	Not Tested	Not Tested	1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.9% 6	3.7% 11	2.0% 6	2.8% 6	4.5% 5	
	Ceftiofur	Chicken	0.5% 1	2.0% 11	5.2% 75	7.6% 89	4.1% 54	10.2% 153	9.8% 113	12.4% 159	12.2% 242	12.8% 177	15.4% 153	8.7% 54	
		Turkey	3.7% 4	0.4% 1	4.6% 33	3.3% 17	5.1% 28	3.3% 8	1.5% 4	4.7% 11	3.5% 8	5.3% 16	11.1% 30	5.4% 8	
		Cattle	0.0% 0	2.1% 6	4.2% 67	9.8% 136	11.4% 102	17.4% 175	21.0% 141	13.3% 81	21.6% 71	18.8% 73	15.5% 68	16.3% 72	
		Swine	0.0% 0	0.1% 1	1.9% 17	1.3% 6	2.2% 9	3.2% 12	4.3% 9	1.9% 6	3.7% 11	2.0% 6	2.8% 6	4.5% 5	
	Ceftriaxone ¹	Chicken	0.5% 1	1.8% 10	4.6% 66	7.4% 87	4.1% 54	9.9% 149	9.7% 112	12.3% 158	12.2% 242	12.8% 177	15.6% 155	8.7% 54	
		Turkey	3.7% 4	0.4% 1	4.2% 30	3.1% 16	4.7% 26	3.3% 8	1.1% 3	4.7% 11	3.5% 8	5.3% 16	11.1% 30	5.4% 8	
		Cattle	0.0% 0	2.1% 6	3.9% 63	9.9% 137	11.3% 101	17.3% 174	21.0% 141	13.5% 82	20.7% 68	18.5% 72	15.9% 70	16.0% 71	
		Swine	0.0% 0	0.1% 1	1.3% 11	1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.6% 5	3.7% 11	1.6% 5	2.4% 5	4.5% 5	
	Cephalothin	Chicken	1.4% 3	4.5% 25	5.8% 83	7.8% 91	4.7% 62	10.5% 158	10.4% 121	10.4% 121	Not Tested	Not Tested	Not Tested	Not Tested	
		Turkey	5.6% 6	5.0% 12	10.5% 75	8.3% 43	13.1% 72	9.8% 24	11.1% 29	11.1% 29	Not Tested	Not Tested	Not Tested	Not Tested	
		Cattle	0.0% 0	2.1% 6	4.7% 76	9.9% 137	11.6% 104	17.7% 178	21.2% 142	21.2% 142	Not Tested	Not Tested	Not Tested	Not Tested	
		Swine	0.0% 0	0.1% 1	0.8% 7	2.4% 11	2.2% 9	3.2% 12	3.8% 8	3.8% 8	Not Tested	Not Tested	Not Tested	Not Tested	
	Folate Pathway Inhibitors	Sulfonamides	Chicken	24.8% 53	23.7% 133	15.9% 229	18.4% 216	11.8% 154	8.9% 133	10.3% 119	11.9% 152	8.5% 169	10.7% 148	10.4% 103	13.3% 83
			Turkey	37.4% 40	32.1% 77	36.0% 257	25.1% 130	38.0% 209	30.3% 74	28.2% 74	36.4% 86	37.0% 84	27.3% 83	25.5% 69	24.3% 36
			Cattle	20.8% 5	15.5% 44	15.0% 242	19.9% 276	19.7% 176	22.3% 225	25.1% 168	22.7% 138	27.4% 90	24.2% 94	21.6% 95	24.8% 110
			Swine	34.2% 38	29.0% 230	30.7% 269	35.7% 161	34.9% 146	34.6% 131	25.1% 53	37.0% 114	32.9% 99	26.6% 81	30.8% 65	31.5% 35
Trimethoprim-Sulfamethoxazole		Chicken	0.5% 1	1.2% 7	1.1% 16	0.4% 5	0.5% 6	0.8% 12	0.3% 4	0.2% 3	0.2% 4	0.1% 1	0.0% 0	0.3% 2	
		Turkey	3.7% 4	2.5% 6	4.2% 30	1.5% 8	2.5% 14	2.5% 6	2.3% 6	0.8% 2	1.8% 4	1.0% 3	1.1% 3	1.4% 2	
		Cattle	4.2% 1	2.5% 7	2.4% 39	2.2% 30	2.6% 23	2.5% 25	3.3% 22	1.5% 9	4.9% 16	4.6% 18	3.0% 13	4.5% 20	
		Swine	1.8% 2	0.3% 2	1.1% 10	0.9% 4	0.0% 0	1.6% 6	2.4% 5	1.6% 5	2.3% 7	2.0% 6	1.9% 4	2.7% 3	

¹ In this report, the revised ceftriaxone breakpoints from the CLSI M100-S20 document, published in January 2010, were used ($\geq 4\mu\text{g/ml}$). In previous NARMS reports the ceftriaxone breakpoints from the CLSI M100-S19 were used ($\geq 64\mu\text{g/ml}$).

Table 4A (continued). Resistance among *Salmonella* by Animal Source, 1997-2008

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Number of Isolates Tested		Chicken	214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624
		Turkey	107	240	713	518	550	244	262	236	227	304	271	148
		Cattle	24	284	1610	1388	893	1008	670	607	329	389	439	443
		Swine	111	793	876	451	418	379	211	308	301	304	211	111
Penicillins	Ampicillin	Chicken	11.7%	12.8%	12.4%	13.0%	9.4%	14.3%	13.7%	14.5%	14.0%	14.9%	17.0%	10.6%
			25	72	179	152	123	215	159	185	279	205	169	66
		Turkey	12.1%	10.4%	17.7%	16.2%	19.5%	18.0%	18.7%	22.0%	22.9%	25.3%	36.9%	32.4%
			13	25	126	84	107	44	49	52	52	77	100	48
	Cattle	12.5%	9.2%	12.5%	18.7%	17.9%	23.9%	28.1%	19.3%	26.7%	22.4%	20.0%	21.7%	
		3	26	202	259	160	241	188	117	88	87	88	96	
	Swine	16.2%	12.9%	10.8%	18.8%	11.7%	13.7%	12.8%	16.2%	13.6%	11.5%	18.0%	14.4%	
		18	102	95	85	49	52	27	50	41	35	38	16	
Phenicols	Chloramphenicol	Chicken	2.3%	2.9%	1.8%	4.6%	2.5%	2.4%	2.1%	1.3%	1.8%	1.7%	1.8%	1.8%
			5	16	26	54	33	36	24	16	36	24	18	11
		Turkey	3.7%	0.8%	4.1%	4.1%	3.8%	5.3%	4.2%	4.7%	4.8%	3.9%	5.5%	2.7%
			4	2	29	21	21	13	11	11	11	12	15	4
	Cattle	4.2%	5.6%	8.5%	15.1%	16.5%	20.6%	25.1%	17.6%	21.9%	19.8%	20.0%	19.8%	
		1	16	137	209	147	208	168	107	72	77	88	87	
	Swine	11.7%	8.4%	8.0%	12.4%	7.7%	10.0%	8.5%	12.7%	10.6%	7.9%	15.2%	9.9%	
		13	67	70	56	32	38	18	39	32	24	32	11	
Quinolones	Ciprofloxacin	Chicken	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	1	0	0	0	0	0
		Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0
Nalidixic Acid	Chicken	0.0%	0.2%	0.2%	0.5%	0.0%	0.8%	0.4%	0.5%	0.3%	0.1%	0.1%	0.0%	
		0	1	3	6	0	12	5	6	6	2	1	0	
	Turkey	4.7%	2.1%	5.3%	5.4%	5.1%	5.3%	3.8%	2.1%	2.2%	0.7%	1.1%	0.7%	
		5	5	38	28	28	13	10	5	5	2	3	1	
	Cattle	0.0%	0.4%	0.1%	0.4%	0.4%	0.4%	0.4%	2.0%	1.5%	0.5%	0.7%	0.7%	
		0	1	1	6	4	4	3	12	5	2	3	3	
	Swine	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	
		0	0	0	1	0	1	0	0	1	0	0	0	
Tetracyclines	Tetracycline	Chicken	20.6%	20.5%	25.0%	26.3%	21.9%	24.9%	26.2%	27.4%	28.3%	31.8%	35.5%	30.4%
			44	115	359	308	286	374	303	351	563	439	353	190
		Turkey	52.3%	45.8%	52.9%	56.2%	54.9%	54.5%	58.8%	48.3%	54.6%	61.8%	73.8%	64.2%
			56	110	377	291	302	133	154	114	124	188	200	95
	Cattle	25.0%	24.3%	20.9%	25.8%	26.3%	32.0%	36.9%	31.8%	34.0%	30.3%	27.3%	29.3%	
		6	69	336	358	235	323	247	193	112	118	120	130	
	Swine	52.3%	47.5%	48.4%	54.3%	53.1%	57.8%	43.1%	58.8%	54.8%	62.8%	54.5%	51.4%	
		58	377	424	245	222	219	91	181	165	191	115	57	