Web annex

DANMAP 2018

DANMAP 2018 - Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark

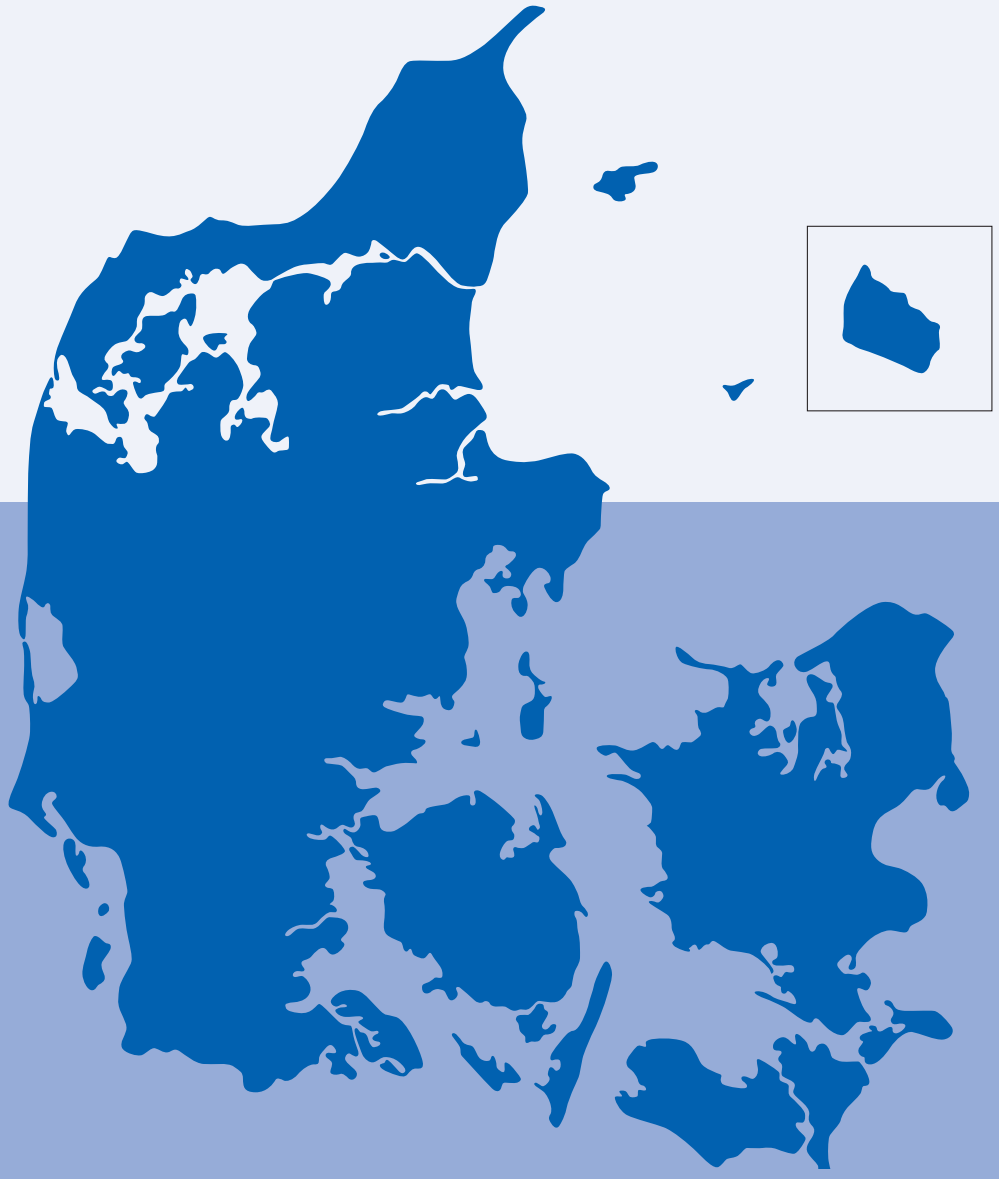

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Table A4.1 Use of antimicrobial agents in pigs (mill. kg-doses), estimated total live biomass (mill. tonnes) and total DAPD per age group per year, Denmark

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Year	Aminoglycosides	Amphenicols	Cephalosporins	Colistin	Fluoroquinolones	Lincosamides	Macrolides	Penicillin's, b-lactamase sensitive	Penicillin's, others(a)	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	Total kg-doses (mill.)	Estimated live biomass (mill. tonnes)	DAPD
Sows and piglets															
2009	146	10	44	17	<1	106	277	573	287	312	406	333	2510	*102*	*25*
2010	149	15	23	20	0	89	265	558	298	228	418	298	2362	*100*	*24*
2011	131	20	<1	17	1	63	206	481	250	103	350	211	1835	*98*	*19*
2012	134	18	<1	17	2	57	237	482	239	99	352	226	1864	*96*	*19*
2013	130	28	<1	18	3	59	279	520	235	133	361	251	2021	*96*	*21*
2014	129	27	<1	26	1	62	285	516	230	87	338	248	1950	*97*	*20*
2015	126	33	<1	29	0	57	274	499	235	117	315	227	1913	*96*	*20*
2016	116	34	<1	31	<1	56	288	488	226	144	291	200	1874	*94*	*20*
2017	114	37	<1	10	<1	59	318	502	232	107	286	150	1814	*96*	*19*
2018	123	37	<1	<1	0	58	331	523	231	140	283	133	1859	*98*	*19*
Weaners															
2009	101	3	5	103	0	268	941	69	179	560	70	1366	3666	*29*	*126*
2010	92	3	3	122	0	249	896	71	169	580	58	1263	3506	*30*	*118*
2011	89	3	<1	98	<1	204	701	68	144	412	46	1069	2834	*31*	*92*
2012	88	3	<1	107	<1	239	807	67	152	424	55	1233	3174	*30*	*105*
2013	99	3	<1	102	0	236	806	72	173	482	93	1256	3324	*30*	*110*
2014	101	4	<1	169	0	217	737	75	186	457	89	1146	3183	*31*	*103*
2015	96	9	<1	215	0	213	726	81	193	447	75	1077	3132	*32*	*99*
2016	86	12	<1	228	0	215	747	71	222	416	70	1051	3120	*33*	*96*
2017	179	11	<1	84	0	272	945	82	250	442	73	721	3059	*32*	*97*
2018	308	12	<1	<1	0	242	959	85	254	418	56	642	2976	*33*	*91*
Finishers															
2009	7	2	2	2	0	137	637	413	84	723	6	926	2938	*116*	*25*
2010	13	1	1	2	0	137	640	453	86	784	6	899	3022	*120*	*25*
2011	12	4	<1	<1	<1	123	467	406	62	596	7	750	2427	*121*	*20*
2012	14	<1	<1	<1	0	119	507	386	69	588	9	782	2474	*112*	*22*
2013	10	<1	<1	<1	0	108	453	397	71	701	17	836	2595	*111*	*23*
2014	8	<1	<1	3	0	100	438	399	58	638	12	746	2402	*113*	*21*
2015	6	2	<1	6	0	93	382	413	51	580	8	632	2173	*110*	*20*
2016	4	<1	<1	3	0	80	383	369	47	568	11	562	2029	*110*	*18*
2017	6	<1	<1	1	0	85	439	370	46	578	9	376	1910	*106*	*18*
2018	6	1	<1	0	0	79	476	388	43	555	10	282	1840	*109*	*17*

Note: A 'kg dose' is the defined daily dose (DADD) in kg active compound per kg live biomass per day. The DADDs are defined for each antimicrobial agent, administration route and animal species. Total DAPDs are calculated as the total estimated number of kg doses used per year divided by the estimated live biomass in the age group (in tonnes, cummulated over the 365 days in a year)

a) Penicillins with extended spectrum and combination penicillins, incl. b-lactamase inhibitors

Table A4.2 Use of antimicrobial agents in cattle (mill. kg-doses), estimated total live biomass (mill. tonnes) and total DAPD per age group per year, Denmark

DANMAP 2018

Year	Aminoglycosides	Amphenicols	Cephalosporins	Fluoroquinolones	Lincosamides	Macrolides	Other AB	Penicillins, b-lactamase sensitive	Penicillins, others(a)	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	Total kg-doses (mill.)	Estimated live biomass (mill. tonnes)	DAPD
Calves <12 months															
2009	17	30	2	<1	<1	48	2	23	11	<1	17	57	206	*42*	*5*
2010	18	36	2	<1	<1	46	2	22	13	<1	19	64	223	*43*	*5*
2011	18	47	2	<1	<1	48	2	22	13	0	18	55	225	*42*	*5*
2012	15	48	2	<1	<1	66	2	22	12	<1	13	49	229	*42*	*5*
2013	14	48	2	<1	<1	65	4	21	13	0	9	54	231	*41*	*6*
2014	12	52	1	<1	<1	59	6	22	13	0	8	59	231	*41*	*6*
2015	16	55	<1	<1	<1	61	4	24	12	0	8	63	244	*41*	*6*
2016	21	63	<1	<1	<1	59	3	29	10	0	7	68	261	*41*	*6*
2017	20	71	<1	0	<1	58	1	28	9	0	6	66	261	*41*	*6*
2018	27	80	<1	<1	<1	58	<1	35	8	0	6	73	289	*41*	*7*
Cattle >12 months															
2009	14	2	41	<1	<1	26	<1	493	58	0	46	171	852	*225*	*4*
2010	17	3	41	<1	<1	23	<1	526	56	<1	47	171	883	*226*	*4*
2011	17	4	41	0	<1	25	<1	511	52	<1	45	172	867	*225*	*4*
2012	16	3	43	0	<1	24	<1	490	43	<1	44	158	821	*223*	*4*
2013	12	2	37	0	<1	22	<1	468	38	<1	39	149	767	*222*	*3*
2014	11	1	27	0	<1	22	<1	491	39	<1	42	154	788	*216*	*4*
2015	13	1	9	<1	<1	18	<1	481	38	0	43	151	754	*215*	*4*
2016	11	2	10	<1	<1	19	<1	471	35	0	45	133	725	*215*	*3*
2017	10	3	9	0	<1	19	<1	454	33	0	39	122	689	*214*	*3*
2018	11	3	9	<1	<1	17	<1	461	32	0	39	120	693	*211*	*3*

Note: A 'kg dose' is the defined daily dose (DADD) in kg active compound per kg live biomass per day. The DADDs are defined for each antimicrobial agent, administration route and animal species. Total DAPDs are calculated as the total estimated number of kg doses used per year divided by the estimated live biomass in the age group (in tonnes, cummulated over the 365 days in a year)

a) Penicillins with extended spectrum and combination penicillins, incl. b-lactamase inhibitors

Table A4.3 Use of antimicrobial agents in fur animals (mill. kg-doses), estimated total live biomass (mill. tonnes) and total DAPD per year, Denmark

DANMAP 2018

Year	Aminoglycosides	Amphenicols	Cephalosporins	Fluoroquinolones	Lincosamides	Macrolides	Other AB	Penicillins, b-lactamase sensitive	Penicillins, others(a)	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	Total kg-doses (mill.)	Estimated live biomass (mill. tonnes)	DAPD
							Mink								
2009	1	<1	<1	0	<1	39	49	<1	60	0	26	70	245	*7*	*37*
2010	1	<1	<1	<1	0	40	63	<1	80	0	13	77	275	*7*	*41*
2011	<1	<1	<1	<1	<1	55	76	<1	95	0	23	100	350	*7*	*49*
2012	<1	<1	<1	<1	<1	61	75	<1	110	0	42	75	364	*8*	*47*
2013	<1	<1	<1	<1	0	56	69	<1	99	0	39	57	321	*9*	*37*
2014	<1	<1	0	1	0	37	52	<1	78	0	39	60	267	*9*	*29*
2015	<1	<1	<1	3	<1	56	66	<1	108	0	35	67	335	*10*	*34*
2016	<1	<1	<1	<1	0	48	80	<1	100	<1	41	80	349	*9*	*38*
2017	11	<1	0	0	0	40	94	<1	132	0	31	96	404	*10*	*40*
2018	3	<1	0	0	0	18	47	<1	100	0	13	48	231	*10*	*23*

Note: A 'kg dose' is the defined daily dose (DADD) in kg active compound per kg live biomass per day. The DADDs are defined for each antimicrobial agent, administration route and animal species. Total DAPDs are calculated as the total estimated number of kg doses used per year divided by the estimated live biomass in the age group (in tonnes, cummulated over the 365 days in a year)

a) Penicillins with extended spectrum and combination penicillins, incl. b-lactamase inhibitors

Table A5.1 Total Consumption of antimicrobial agents for systemic use in humans, kg active compound, Denmark

DANMAP 2018

ATC group	Therapeutic group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
J01AA	Tetracyclines	2044	2165	2206	2214	2253	2015	1790	1740	1650	1508
J01CA	Penicillins with extended spectrum	6104	6345	6384	6003	6001	6044	6203	6250	6510	6556
J01CE	Beta-lactamase sensitive penicillins	21763	22312	22668	20282	20223	19187	19013	18463	17532	16485
J01CF	Beta-lactamase resistant penicillins	5274	5438	5713	5667	6126	6421	6520	6920	7291	7649
J01CR	Comb. of penicillins, including beta-lactamase inhibitors	1850	2617	3710	5380	6322	7359	8312	8664	7254	8210
J01D	Cephalosporins and related substances	2135	2095	2541	2363	2167	1910	1820	1662	3104	1619
J01EA	Trimethoprim and derivatives	399	418	414	431	442	464	467	473	132	456
J01EB	Short-acting sulfonamides	2222	2165	1992	1860	1838	1729	1478	1383	21	1176
J01EE	Comb. of sulfonamides and trimethoprim, including derivatives	209	169	251	277	357	385	406	409	421	445
J01FA	Macrolides	2356	2467	2535	2118	1837	1712	1640	1631	1456	1323
J01FF	Lincosamides	113	124	137	143	162	160	165	174	177	180
J01G	Aminoglycosides	23	24	27	30	29	21	21	26	29	27
J01MA	Fluoroquinolones	1382	1465	1457	1413	1359	1314	1279	1220	1140	1068
J01XA	Glycopeptides	86	90	108	108	112	98	90	89	107	102
J01XB	Polymyxins	154	164	163	153	149	152	151	171	164	169
J01XC	Steroid antibacterials (fusidic acid)	62	65	55	48	41	37	31	27	20	19
J01XD	Imidazoles	260	258	260	269	270	289	268	282	288	264
J01XE	Nitrofuran derivatives (nitrofurantoin)	201	208	208	205	202	199	189	182	113	68
J01XX01	Fosfomycin	0	0	0	0	0	0	0	0	0	0
J01XX05	Methenamine	1048	1078	1053	1040	993	993	1042	1131	1197	1228
J01XX08+09	Linezolid, daptomycin	14	14	17	18	20	19	24	20	20	28
J01XX11	Tedizolid	0	0	0	0	0	0	0	0	0	0
P01AB01	Nitroimidazole derivatives	1280	1323	1352	1353	1332	1336	1346	1344	1225	1165
A07AA09	Intestinal antiinfectives (vancomycin)	20	29	43	47	47	48	42	43	45	43
J01, P01AB01 and A07AA09	Antibacterial agents (total)	48996	51032	53296	51424	52282	51890	52300	52303	49897	49786

Figure A5.2 Bed-days and admissions to hospitals in Denmark, 2009-2018

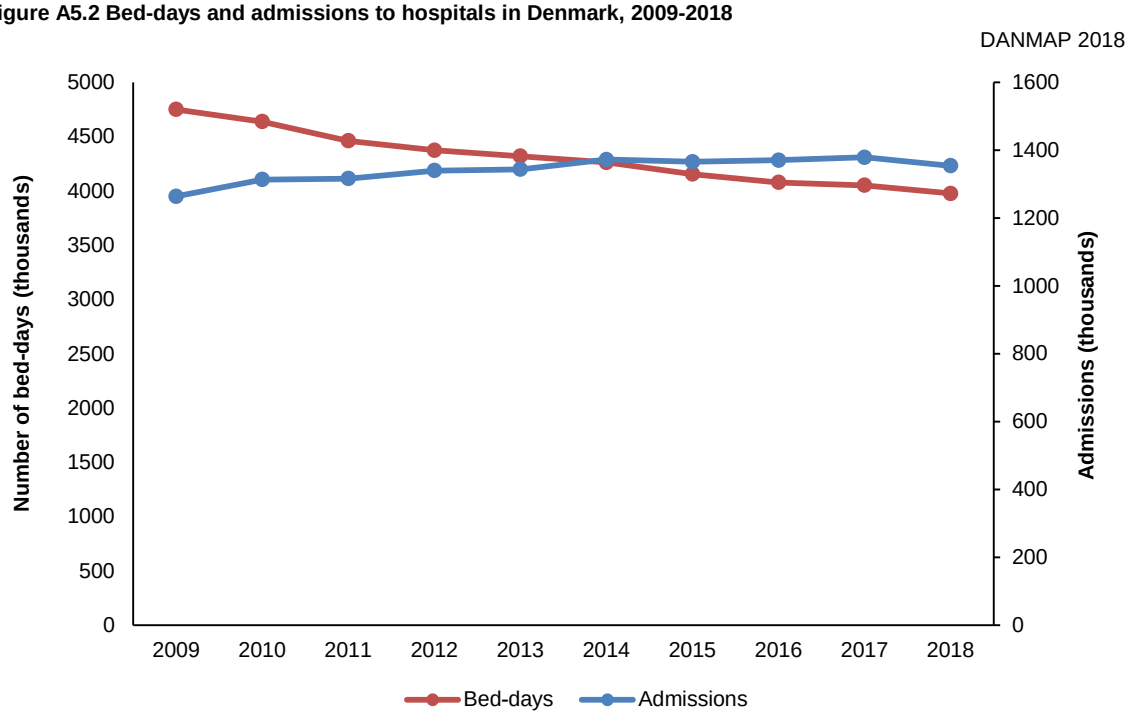


Figure A5.3 Ratio between bed-days and admissions at a regional level, Denmark

DANMAP 2018

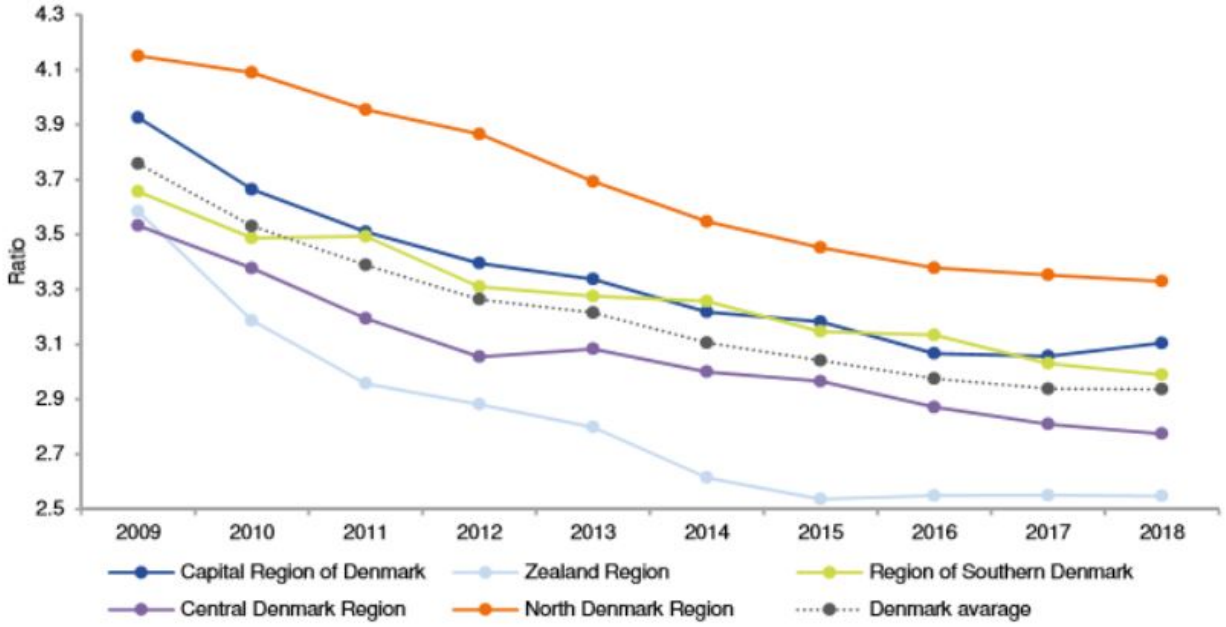


Table A6.1 Distributions of MICs and resistance (%) in *Campylobacter jejuni* from broilers (n=195) and cattle (n=101), Denmark

DANMAP 2018

Antimicrobial agent	Animal species	% Resistant	95% Confidence interval	Distribution (%) of MICs											
				0.125	0.25	0.5	1	2	4	8	16	32	64	128	>128
Ciprofloxacin	Broilers	43.1	[36.3-50.1]	52.8	3.1	1.0			0.5	9.7		32.8			
	Cattle	19.8	[13.2-28.6]	73.3	4.0	3.0				5.0		14.9			
Erythromycin	Broilers	0	[0-1.9]				100								
	Cattle	0	[0-3.7]				100								
Gentamicin	Broilers	0	[0-1.9]		2.6	52.3	44.1	1.0							
	Cattle	0	[0-3.7]		4.0	47.5	48.5								
Nalidixic acid	Broilers	43.1	[36.3-50.1]					4.6	42.1	9.7	0.5			43.1	
	Cattle	19.8	[13.2-28.6]					2.0	55.4	21.8	1.0			19.8	
Streptomycin	Broilers	5.1	[2.8-9.2]			2.1	44.1	38.5	10.3	0.5		4.6			
	Cattle	4.0	[1.6-9.7]			1.0	19.8	61.4	13.9			4.0			
Tetracycline	Broilers	31.8	[25.7-38.6]			67.2	1.0				1.5	0.5		29.7	
	Cattle	7.9	[4.1-14.9]			92.1								7.9	

Vertical solid lines indicate EUCAST epidemiological cut-off values. EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.2 Distribution of MICs and resistance (%) in *Campylobacter jejuni* from human cases reported as domestically acquired (n=94) and associated with travel abroad (n=59), Denmark

DANMAP 2018

Antimicrobial agent	Animal species	% Resistant	95% Confidence interval	Distribution (%) of MICs											
				0.125	0.25	0.5	1	2	4	8	16	32	64	128	>128
Ciprofloxacin	Domestically acquired	39.4	[30.1-49.5]	59.6	1.1				2.1	18.1		19.1			
	Travel abroad reported	83.1	[71.5-90.5]	16.9					6.8	23.7		52.5			
Erythromycin	Domestically acquired	0	[0-3.9]				95.7	4.3							
	Travel abroad reported	0	[0-6.1]				86.4	13.6							
Gentamicin	Domestically acquired	0	[0-3.9]	23.4	69.1	7.4									
	Travel abroad reported	0	[0-6.1]	32.2	64.4	3.4									
Nalidixic acid	Domestically acquired	38.3	[29.1-48.4]					7.4	48.9	5.3		1.1		37.2	
	Travel abroad reported	83.1	[71.5-90.5]					6.8	10.2			1.7		81.4	
Streptomycin	Domestically acquired	4.3	[1.7-10.4]		1.1	10.6	71.3	12.8				4.3			
	Travel abroad reported	11.9	[5.9-22.5]			16.9	67.8	1.7	1.7	1.7		10.2			
Tetracycline	Domestically acquired	34.0	[25.3-44.1]			64.9	1.1		1.1		2.1	5.3		25.5	
	Travel abroad reported	62.7	[50-73.9]			33.9	3.4			3.4	3.4	6.8		49.2	

Vertical solid lines indicate EUCAST epidemiological cut-off values. EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.3 Distributions (n, %) of AMR profiles in *Campylobacter jejuni* from broilers, cattle and human cases, Denmark

DANMAP 2018

	Broilers	Cattle	Human		
AMR profiles 2018	Danish	Danish	Domestically acquired	Unknown origin	Travel abroad reported
FS	103 (53%)	73 (72%)	46 (49%)	18 (45%)	9 (15%)
CIP NAL	29 (15%)	16 (16%)	13 (14%)	4 (10%)	13 (22%)
CIP NAL TET	46 (24%)	3 (3%)	22 (23%)	12 (30%)	29 (49%)
CIP TET			1 (1%)		
TET	7 (4%)	5 (5%)	8 (9%)	1 (3%)	1 (2%)
STR	1 (1%)	3 (3%)	3 (3%)	1 (3%)	
CIP NAL STR TET	9 (5%)		1 (1%)	4 (10%)	7 (12%)
CIP NAL STR		1 (1%)			
Number of isolates, 2018	195	101	94	40	59

	Broilers	Cattle	Human		
AMR profiles 2017	Danish	Danish	Domestically acquired	Unknown origin	Travel abroad reported
FS	32 (74%)	159 (67%)	148 (59%)	38 (58%)	6 (8%)
CIP NAL	4 (9%)	60 (25%)	44 (17%)	10 (15%)	19 (24%)
CIP NAL TET	7 (16%)	11 (5%)	44 (17%)	18 (27%)	49 (62%)
TET		4 (2%)	10 (4%)		
STR		1 (0%)			
CIP ERY NAL TET			1 (0%)		3 (4%)
ERY TET		1 (0%)			
CIP ERY NAL			2 (1%)		
CIP GEN NAL			3 (1%)		
CIP ERY GEN NAL TET					2 (3%)
Number of isolates, 2017	43	236	252	66	79

Note:FS=Fully suscpetable; CIP=Ciprofloxacin; ERY=Erythromycin; NAL=Nalidixan; STR=Streptomycin; TET=Tetracycline

Table A6.4 Distribution of MICs and resistance (%) in *Salmonella Typhimurium* from pigs (n=28), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																
			0.015	0.03	0.064	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	75.0	[59-91]							17.9	7.1						75.0				
Azithromycin	0	[0-22.2]									50.0	50.0								
Cefotaxime	0	[0-22.2]					100													
Ceftazidime	0	[0-22.2]						100												
Chloramphenicol	7.1	[0-16.7]										92.9					7.1			
Ciprofloxacin	0	[0-22.2]	14.3	85.7																
Colistin	0	[0-22.2]							92.9	7.1										
Gentamicin	4	[0-10.4]						85.7	10.7						3.6					
Meropenem	0	[0-22.2]		71.4	28.6															
Nalidixic acid	0	[0-22.2]									92.9	7.1								
Sulfonamide	82.1	[68-96.3]										10.7	3.6	3.6						82.1
Tetracycline	75.0	[59-91]								25.0						75.0				
Tigecycline	0	[0-22.2]					57.1	42.9												
Trimethoprim	3.6	[0-10.4]					96.4								3.6					

Includes isolates verified as monophasic variants of S. Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For Salmonella, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.5 Distribution of MICs and resistance (%) in *Salmonella* Derby from pigs (n=43), Denmark

DANMAP Salmonella

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	7.0	[0-14,6]							79.1	14.0						7.0				
Azithromycin	0	[0-14,6]								2.3	25.6	69.8	2.3							
Cefotaxime	0	[0-14,6]					100													
Ceftazidime	0	[0-14,6]						91	9.3											
Chloramphenicol	4.7	[0-10,9]										86.0	9.3				4.7			
Ciprofloxacin	2	[0-6,8]	55.8	41.9				2.3												
Colistin	0	[0-14,6]							98	2.3										
Gentamicin	0	[0-14,6]						93.0	7.0											
Meropenem	0	[0-14,6]		86.0	14.0															
Nalidixic acid	0	[0-14,6]									95.3	2.3	2.3							
Sulfonamide	16.3	[5,2-27,3]										55.8	23.3	4.7				2.3		14.0
Tetracycline	20.9	[8,8-33,1]								79.1						20.9				
Tigecycline	0	[0-14,6]					72.1	25.6	2.3											
Trimethoprim	9.3	[0,6-18]					90.7								9.3					

Includes isolates verified as monophasic variants of *S.* Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For *Salmonella,* EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.5 Distribution of MICs and resistance (%) in *Salmonella* Derby from pigs (n=43), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	7.0	[0-14.6]							79.1	14.0						7.0				
Azithromycin	0	[0-14.6]								2.3	25.6	69.8	2.3							
Cefotaxime	0	[0-14.6]					100													
Ceftazidime	0	[0-14.6]						91	9.3											
Chloramphenicol	4.7	[0-10.9]										86.0	9.3				4.7			
Ciprofloxacin	2	[0-6.8]	55.8	41.9				2.3												
Colistin	0	[0-14.6]							97.7	2.3										
Gentamicin	0	[0-14.6]						93.0	7.0											
Meropenem	0	[0-14.6]		86.0	14.0															
Nalidixic acid	0	[0-14.6]									95.3	2.3	2.3							
Sulfonamide	16.3	[5.2-27.3]										55.8	23.3	4.7				2.3		14.0
Tetracycline	20.9	[8.8-33.1]								79.1						20.9				
Tigecycline	0	[0-14.6]					72.1	25.6	2.3											
Trimethoprim	9.3	[0.6-18]					90.7								9.3					

Includes isolates verified as monophasic variants of S. Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For Salmonella, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.6 Distribution of MICs and resistance (%) in *Salmonella* Typhimurium from pork (n=40), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	77.5	[64.6-90.4]							15.0	7.5						77.5				
Azithromycin	5	[0-11.8]									40.0	52.5	2.5	2.5		2.5				
Cefotaxime	0	[0-15.7]					98	3												
Ceftazidime	0	[0-15.7]						98	2.5											
Chloramphenicol	20.0	[7.6-32.4]										80.0		2.5	5.0		12.5			
Ciprofloxacin	0	[0-15.7]	22.5	72.5	5.0															
Colistin	0	[0-15.7]							97.5	2.5										
Gentamicin	3	[0-7.3]						90.0	7.5						2.5					
Meropenem	0	[0-15.7]		87.5	12.5															
Nalidixic acid	0	[0-15.7]									95.0	5.0								
Sulfonamide	80.0	[67.6-92.4]										15.0	5.0							80.0
Tetracycline	65.0	[50.2-79.8]								35.0				5.0		60.0				
Tigecycline	3	[0-7.3]					65.0	25.0	7.5		2.5									
Trimethoprim	32.5	[18-47]					67.5								32.5					

Includes isolates verified as monophasic variants of S. Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For Salmonella, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.7 Distribution of MICs and resistance (%) in *Salmonella* Derby from pork (n=41), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																	
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	17.1	[5.6-28.6]							70.7	12.2						17.1				
Azithromycin	0	[0-15.3]									46.3	51.2	2.4							
Cefotaxime	0	[0-15.3]					100													
Ceftazidime	0	[0-15.3]						87.8	12.2											
Chloramphenicol	4.9	[0-11.5]										92.7	2.4				4.9			
Ciprofloxacin	0	[0-15.3]	65.9	34.1																
Colistin	0	[0-15.3]							100											
Gentamicin	2.4	[0-7.2]						87.8	9.8						2.4					
Meropenem	0	[0-15.3]		95.1	4.9															
Nalidixic acid	0	[0-15.3]									100									
Sulfonamide	17.1	[5.6-28.6]										78.0	4.9							17.1
Tetracycline	19.5	[7.4-31.6]								78.0	2.4					19.5				
Tigecycline	0	[0-15.3]					80.5	12.2	7.3											
Trimethoprim	17.1	[5.6-28.6]					82.9								17.1					

Includes isolates verified as monophasic variants of S. Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For Salmonella, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.8 Distribution of MICs and resistance (%) in *Salmonella* Typhimurium from from human cases reported as domestically acquired (n=146), associated with travel abroad (n=65) and of unknown origin (n=94), Denmark

DANMAP 2018

Antimicrobial agent	Origin	% Resistant	95% Confidence interval	Distribution (%) of MICs																
				0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	Domestically acquired	67.1	[59.1-74.2]							18.5	13.7	0.7					67.1				
	Travel abroad reported	69.2	[57.2-79.1]							21.5	9.2						69.2				
	Unknown origin	56.4	[46.3-66]							24.5	17.0	2.1					56.4				
Azithromycin	Domestically acquired	0.7	[0.1-3.8]									40.4	55.5	3.4			0.7				
	Travel abroad reported	0	[0-5.6]									46.2	50.8	3.1							
	Unknown origin	0	[0-3.9]									40.4	56.4	3.2							
Cefotaxime	Domestically acquired	0.7	[0.1-3.8]					96.6	2.7				0.7								
	Travel abroad reported	3.1	[0.8-10.5]					96.9					3.1								
	Unknown origin	0	[0-3.9]					97.9	2.1												
Ceftazidime	Domestically acquired	0.7	[0.1-3.8]						93.2	6.2				0.7							
	Travel abroad reported	1.5	[0.3-8.2]						92.3	4.6	1.5	1.5									
	Unknown origin	0	[0-3.9]						92.6	7.4											
Chloramphenicol	Domestically acquired	8.2	[4.8-13.8]										82.9	8.9	0.7	1.4		6.2			
	Travel abroad reported	23.1	[14.5-34.6]										69.2	7.7	1.5			21.5			
	Unknown origin	5.3	[2.3-11.9]										87.2	7.4		1.1		4.3			
Ciprofloxacin	Domestically acquired	4.1	[1.5-7.8]	6.8	82.2	6.8	0.7	0.7	2.1		0.7										
	Travel abroad reported	24.6	[15.8-36.3]	6.2	66.2	3.1	1.5	7.7	13.8	1.5											
	Unknown origin	3.2	[1.1-9]	3.2	90.4	3.2		2.1	1.1												
Colistin	Domestically acquired	1.4	[0.4-4.9]							58.9	39.7	1.4									
	Travel abroad reported	1.5	[0.3-8.2]							81.5	16.9	1.5									
	Unknown origin	2.1	[0.6-7.4]							40.4	57.4	2.1									
Gentamicin	Domestically acquired	1.4	[0.4-4.9]						71.9	26.0	0.7					1.4					
	Travel abroad reported	6.2	[2.4-14.8]						78.5	13.8	1.5	3.1		3.1							
	Unknown origin	1.1	[0.2-5.8]						59.6	39.4						1.1					
Meropenem	Domestically acquired	0	[0-2.6]		77.4	22.6															
	Travel abroad reported	0	[0-5.6]		87.7	12.3															
	Unknown origin	0	[0-3.9]		75.5	24.5															
Nalidixic acid	Domestically acquired	2.1	[0.7-5.9]									67.8	27.4	2.7	1.4			0.7			
	Travel abroad reported	10.8	[5.3-20.6]									64.6	13.8	10.8	1.5			9.2			
	Unknown origin	3.2	[1.1-9]									76.6	20.2					3.2			
Sulfonamide	Domestically acquired	65.8	[57.7-73]												4.1	20.5	8.9	0.7			65.8
	Travel abroad reported	63.1	[50.9-73.8]												13.8	15.4	7.7				63.1
	Unknown origin	56.4	[46.3-66]											1.1	2.1	28.7	11.7				56.4
Tetracycline	Domestically acquired	69.9	[62-76.7]								28.8	1.4		0.7			69.2				
	Travel abroad reported	72.3	[60.4-81.7]								27.7				1.5		70.8				
	Unknown origin	72.3	[62.6-80.4]								26.6	1.1					72.3				
Tigecycline	Domestically acquired	1.4	[0.4-4.9]					47.3	48.6	2.7	1.4										
	Travel abroad reported	3.1	[0.8-10.5]					41.5	47.7	7.7	3.1										
	Unknown origin	1.1	[0.2-5.8]					70.2	25.5	3.2	1.1										
Trimethoprim	Domestically acquired	10.3	[6.3-16.3]					74.0	13.7	2.1						10.3					
	Travel abroad reported	21.5	[13.3-33]					67.7	10.8							21.5					
	Unknown origin	2.1	[0.6-7.4]					78.7	19.1							2.1					

Includes isolates verified as monophasic variants of S. Typhimurium with antigenic formulas S. 4,[5],12:i:-.

Vertical solid lines indicate EUCAST epidemiological cut-off values. For Salmonella, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 256). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.9 Distributions (n, %) of AMR profiles in *Salmonella* Typhimurium from pigs, pork and humans, Denmark

DANMAP 2018

2018 AMR profiles	Pigs	Pork	Human		
	Danish	Danish	Domestically acquired	Unknown origin	Travel abroad reported
FS	3 (11%)	5 (13%)	32 (22%)	22 (23%)	12 (18%)
AMP			2 (1%)	2 (2%)	
AMP AZM CAC CHL CIP CTX NAL SMX TET TMP			1 (1%)		
AMP AZM CHL SMX TET TMP		1 (3%)			
AMP AZM SMX TET TMP		1 (3%)			
AMP CAC CHL CIP CTX GEN SMX TET TMP					1 (2%)
AMP CHL CIP CTX GEN SMX TET TMP					1 (2%)
AMP CHL CIP GEN NAL SMX TET TMP					1 (2%)
AMP CHL CIP GEN TET TMP			1 (1%)		
AMP CHL CIP NAL SMX TET			1 (1%)	1 (1%)	4 (6%)
AMP CHL CIP NAL SMX TET TMP					1 (2%)
AMP CHL CIP SMX TET TMP			2 (1%)		4 (6%)
AMP CHL GEN SMX TET				1 (1%)	
AMP CHL GEN SMX TET TMP			1 (1%)		
AMP CHL SMX TET	2 (7%)	1 (3%)	4 (3%)	2 (2%)	1 (2%)
AMP CHL SMX TET TGC TMP		1 (3%)			
AMP CHL SMX TET TMP		3 (8%)			1 (2%)
AMP CHL SMX TMP		1 (3%)	1 (1%)		
AMP CIP NAL SMX				1 (1%)	
AMP CIP NAL SMX TET			1 (1%)		
AMP CIP SMX TET					1 (2%)
AMP CIP SMX TET TMP					1 (2%)
AMP CST SMX TET			1 (1%)	1 (1%)	
AMP GEN SMX		1 (3%)			
AMP GEN SMX TET	1 (4%)				
AMP GEN SMX TET TMP					1 (2%)
AMP SMX	4 (14%)	7 (18%)	7 (5%)	1 (1%)	1 (2%)
AMP SMX TET	14 (50%)	10 (25%)	66 (45%)	43 (46%)	17 (26%)
AMP SMX TET TGC TMP			1 (1%)		1 (2%)
AMP SMX TET TMP		5 (13%)	6 (4%)		
AMP SMX TMP					1 (2%)
AMP TET			3 (2%)	1 (1%)	8 (12%)
CHL SMX TET					1 (2%)
CHL SMX TET TMP		1 (3%)		1 (1%)	
CHL TET			1 (1%)		
CIP					1 (2%)
CIP NAL					1 (2%)
CIP NAL TET				1 (1%)	
CST			1 (1%)		1 (2%)
CST TET				1 (1%)	
SMX			1 (1%)		1 (2%)
SMX TET	1 (4%)		1 (1%)	1 (1%)	1 (2%)
SMX TET TGC TMP			1 (1%)	1 (1%)	1 (2%)
SMX TET TMP	1 (4%)		1 (1%)		
TET	2 (7%)	3 (8%)	10 (7%)	14 (15%)	1 (2%)
Number of isolates	28	40	146	94	65

Note:FS=Fully suscpetable; AMP=Ampicillin; AZI=Azithromycin; CAC=Ceftazidime; CHL=Chloramphenicol; CIP=Ciprofloxacin; CTX=Cefotaxime; GEN=Gentamicin; NAL=Nalidixan; SMX=Sulphamethoxazole; TCG=Tigecyclin; TET=Tetracycline; TMP=Trimethoprim

Table A6.10 Distribution of MICs and resistance (%) among haemolytic *Escherichia coli* from pigs (n=282), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence	Distribution (%) of MICs																
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048
Tetracycline	61.3	[55.5-66.8]								37.2	1.1	0.4	0.4	5.7	55.3					
Chloramphenicol	20.6	[16.3-25.7]								0.7	44.7	30.1	3.9	3.5	2.8	14.2				
Florfenicol	13.1	[9.7-17.6]								7.1	48.6	30.1	1.1			13.1				
Ampicillin	61.3	[55.5-66.8]							3.2	23.4	11.7	0.4		0.4	61.0					
Amoxicillin/clavulanic acid	2.5	[1.2-5]								17.0	21.3	50.7	8.5	1.8	0.7					
Ceftiofur	0	[0-1.3]						97.2	2.5	0.4										
Cefotaxime	2.5	[1.2-5]				96.5	1.1	0.4	1.1	1.1										
Trimethoprim	55.3	[49.5-61]							43.3	0.4	0.4	0.7			55.3					
Sulfonamide	67.4	[61.7-72.6]													31.9	0.7			0.4	67.0
Streptomycin	73.8	[68.3-78.5]										22.7	3.5	4.3	6.4	13.5	49.6			
Gentamicin	13.5	[10-18]						64.5	16.3	2.5	1.1	2.1	5.7	7.8						
Neomycin	16.0	[12.1-20.7]								78.7	3.5	1.8		2.8	13.1					
Apramycin	14.5	[10.9-19.1]									73.4	12.1	0.7		13.8					
Ciprofloxacin	0	[0-1.3]	81.2	11.0	1.4	0.4	4.3	1.4	0.4											
Nalidixic acid	6.7	[4.4-10.3]									92.9	0.4		0.4	0.4	6.0				
Colistin	0.4	[0.1-2]							98.2	1.4	0.4									
Spectinomycin	47.2	[41.4-53]											30.5	13.1	9.2	8.2	6.7	32.3		

Note: Isolates from the routine diagnostic laboratory investigation of isolates from dead and diseased pigs submitted to SEGES Pig Research Centre's Laboratory for Pig Diseases in Kjellerup. Occurrences of resistant isolates are presented according to the clinical breakpoints that are currently in use at both DTU National Veterinary Institute and Laboratory for Pig Diseases. The MIC value given is the concetration of amoxacillin. The concentration of clavulanic acid is half the concentration of amoxacillin

Vertical solid lines indicate microbiological breakpoint values for antimicrobial resistance (preferably CLSI); vertical stippled lines indicate breakpoints for intermediate sensitivity

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals
White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A6.11 Distribution of MICs and resistance (%) among *Actinobacillus pleuropneumoniae* from pigs (n=102), Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs														
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256
Tetracycline	2.9	[1-8.3]				1.0		34.3	61.8			2.9					
Florfenicol	0	[0-3.6]				1.0	84.3	14.7									
Penicillin	0	[0-3.6]			7.8	19.6	49.0	23.5									
Ampicillin	0	[0-3.6]						100									
Ceftiofur	0	[0-3.6]		100													
Sulfo-trimethoprim	0	[0-3.6]		35.3	55.9	7.8	1.0										
Erythromycin	100.0	[98.2-100]							1.0	11.8	78.4	8.8					
Tulathromycin	3.9	[1.5-9.7]								1.0	12.7	82.4	3.9				
Tilmicosin	0	[0-3.6]									23.5	74.5	2.0				
Ciprofloxacin	0	[0-3.6]				95.1	2.9	2.0									
Spectinomycin	0	[0-3.6]											2.9	93.1	3.9		
Tiamulin	1.0	[0.2-5.3]								1.0	4.9	56.9	36.3	1.0			

Note: Isolates from the routine diagnostic laboratory investigation of isolates from dead and diseased pigs submitted to SEGES Pig Research Centre's Laboratory for Pig Diseases in Kjellerup. Occurrences of resistant isolates are presented according to the clinical breakpoints that are currently in use at both DTU National Veterinary Institute and Laboratory for Pig Diseases. The MIC value given is the concetration of trimethoprim. The concentration of sulfonamide is 19 times the concentration of trimethoprim

Vertical solid lines indicate microbiological breakpoint values for antimicrobial resistance (preferably CLSI); vertical stippled lines indicate breakpoints for intermediate sensitivity
Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A7.1 Distributions of MICs and resistance (%) in *Escherichia coli* from broilers (n=166), cattle (n=99) and pigs (n=149), Denmark

DANMAP 2018

Antimicrobial agent	Origin	% Resistant	95% Confidence interval	Distribution (%) of MICs																
				0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	Broilers	17.5	[12.4-24]							3.0	48.2	30.7	0.6				17.5				
	Cattle	7.1	[3.5-14]							5.1	27.6	57.1	3.1				7.1				
	Pigs	26.8	[20.4-34.5]							7.4	30.2	30.9	4.7	0.7			26.2				
Azithromycin	Broilers	0	[0-2.3]								9.0	44.6	41.6	4.8							
	Cattle	0	[0-3.8]								15.3	65.3	18.4	1.0							
	Pigs	4	[1.9-8.5]								10.1	53.7	30.9	1.3	2.0		2.0				
Cefotaxime	Broilers	0	[0-2.3]					100													
	Cattle	0	[0-3.8]					100													
	Pigs	0	[0-2.5]					100													
Ceftazidime	Broilers	0	[0-2.3]						100												
	Cattle	0	[0-3.8]						100												
	Pigs	0	[0-2.5]						100												
Chloramphenicol	Broilers	1.8	[0.6-5.2]										97.0	1.2	1.2	0.6					
	Cattle	5.1	[2.2-11.4]										94.9			1.0		4.1			
	Pigs	6.7	[3.7-11.9]										92.6	0.7	1.3	2.0		3.4			
Ciprofloxacin	Broilers	13.3	[8.9-19.3]	72.3	14.5		3.0	7.8	1.2	0.6		0.6									
	Cattle	0	[0-3.8]	95.9	4.1																
	Pigs	1.3	[0.4-4.8]	87.9	10.1	0.7		0.7	0.7												
Colistin	Broilers	0	[0-2.3]							98.8	1.2										
	Cattle	0	[0-3.8]							100											
	Pigs	0	[0-2.5]							100											
Gentamicin	Broilers	1.2	[0.3-4.3]						58.4	37.3	3.0		0.6			0.6					
	Cattle	0	[0-3.8]						74.5	25.5											
	Pigs	0.7	[0.1-3.7]						53.0	39.6	6.7	0.7									
Meropenem	Broilers	0	[0-2.3]		100																
	Cattle	0	[0-3.8]		100																
	Pigs	0	[0-2.5]		100																
Nalidixic acid	Broilers	12.7	[8.4-18.6]									86.1	1.2			3.0		9.6			
	Cattle	0	[0-3.8]									100									
	Pigs	1.3	[0.4-4.8]									98.7						1.3			
Sulfonamide	Broilers	20.5	[15-27.3]										78.9	0.6			0.6				19.9
	Cattle	7.1	[3.5-14]										92.9								7.1
	Pigs	29.5	[22.8-37.3]										69.1	1.3							29.5
Tetracycline	Broilers	13.3	[8.9-19.3]								81.3	5.4			0.6		12.7				
	Cattle	11.2	[6.4-19]								87.8	1.0			2.0		9.2				
	Pigs	32.9	[25.9-40.8]								63.8	3.4			4.0		28.9				
Tigecycline	Broilers	0	[0-2.3]					95.8	4.2												
	Cattle	0	[0-3.8]					100													
	Pigs	0	[0-2.5]					96.6	3.4												
Trimethoprim	Broilers	12.7	[8.4-18.6]					84.3	3.0							12.7					
	Cattle	1.0	[0.2-5.6]					99.0								1.0					
	Pigs	23.5	[17.4-30.9]					76.5								23.5					

Vertical solid lines indicate EUCAST epidemiological cut-off values. For *Salmonella*, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16)

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A7.2 Distribution (n, %) of AMR profiles in indicator *Escherichia coli* from broilers (n=166), cattle (n=99) and pigs (n=149), Denmark

DANMAP 2018

2018 AMR profiles	Broilers	Cattle	Pigs
FS	100 (60%)	88 (89%)	79 (53%)
AMP	5 (3%)		2 (1%)
AMP AZM CHL SMX TET TMP			1 (1%)
AMP AZM CIP NAL SMX TET TMP			2 (1%)
AMP AZM SMX TET TMP			1 (1%)
AMP AZM SMX TMP			1 (1%)
AMP CHL SMX			1 (1%)
AMP CHL SMX TET		2 (2%)	
AMP CHL SMX TET TMP	3 (2%)	1 (1%)	5 (3%)
AMP CIP NAL SMX	1 (1%)		
AMP CIP NAL SMX TET	1 (1%)		
AMP CIP SMX TET TMP	1 (1%)		
AMP SMX	4 (2%)		3 (2%)
AMP SMX TET		2 (2%)	2 (1%)
AMP SMX TET TMP	7 (4%)		12 (8%)
AMP SMX TMP	7 (4%)		5 (3%)
AMP TET		2 (2%)	4 (3%)
AMP TMP			1 (1%)
AZM SMX TET TMP			1 (1%)
CHL			1 (1%)
CHL GEN SMX TET			1 (1%)
CHL SMX TET		1 (1%)	
CHL TET		1 (1%)	
CHL TET TMP			1 (1%)
CIP GEN NAL	2 (1%)		
CIP NAL	16 (10%)		
CIP NAL TET	1 (1%)		
SMX	6 (4%)		4 (3%)
SMX TET	3 (2%)	1 (1%)	3 (2%)
SMX TET TMP			2 (1%)
SMX TMP	1 (1%)		
TET	6 (4%)	1 (1%)	14 (9%)
TMP	2 (1%)		3 (2%)
Total	166	99	149

Note:FS=Fully suscpetable; AMP=Ampicillin; AZI=Azithromycin; CHL=Chloramphenicol; CIP=Ciprofloxacin; GEN=Gentamicin; NAL=Nalidixan; SMX=Sulphamethoxazole; TET=Tetracycline; TMP=Trimethoprim

Table A7.3 Distribution of MICs and resistance (%) in ESBL/AmpC producing *Escherichia coli* from broilers (n=124) recovered by selective enrichment, Denmark

DANMAP 2018

Antimicrobial agent	% Resistant	95% Confidence interval	Distribution (%) of MICs																
			0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	100	[100-100]														100				
Azithromycin	0	[0-5.1]								4.0	49.2	46.0	0.8							
Cefepime	82	[74.6-88.3]			8.1	10.5	61.3	5.6	4.8		0.8	4.0	3.2		1.6					
Cefotaxime	100	[100-100]							7.3	8.9		62.9	11.3	0.8		8.9				
Cefoxitin	86	[79.3-91.7]								2.4	3.2	8.9	4.0	22.6		58.9				
Ceftazidime	100	[100-100]							9.7	12.9	4.0	21.0	45.2	7.3						
Chloramphenicol	0.8	[0-2.4]										97.6	1.6		0.8					
Ciprofloxacin	22.6	[15.2-29.9]	57.3	20.2		8.9	7.3		0.8				5.6							
Colistin	0	[0-5.1]							100											
Ertapenem	0	[0-5.1]	24.2	73.4	2.4															
Gentamicin	0	[0-5.1]						48.4	46.0	5.6										
Imipenem	0	[0-5.1]				29.0	69.4	1.6												
Meropenem	0	[0-5.1]		100																
Sulfonamides	16.1	[9.7-22.6]										83.9					0.8			15.3
Tetracycline	17.7	[11-24.5]								78.2	4.0			0.8		16.9				
Tigecycline	0	[0-5.1]					90.3	9.7												
Trimethoprim	8.9	[3.9-13.9]					91.1								8.9					

Vertical solid lines indicate EUCAST epidemiological cut-off values. For E. coli, EUCAST ECOFF are not available for all compounds and complementary cutoff's are set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 64). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A7.4 Distribution of MICs and resistance (%) in ESBL/AmpC producing *Escherichia coli* from broiler meat (Danish n=36; import n=82) recovered by selective enrichment, Denmark

DANMAP 2018

Antimicrobial agent	Origin	% Resistant	95% Confidence interval	Distribution (%) of MICs																
				0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Ampicillin	Danish	100	[100-100]														100				
	Import	100	[100-100]														100				
Azithromycin	Danish	0	[0-17.4]								11.1	44.4	44.4								
	Import	4	[0-7.7]								12.2	56.1	23.2	4.9	1.2		2.4				
Cefepime	Danish	83.3	[71.2-95.5]				16.7	41.7	11.1	2.8		5.6	16.7	5.6							
	Import	92.7	[87-98.3]			2.4	4.9	18.3	15.9	17.1	6.1	11.0	8.5	11.0		4.9					
Cefotaxime	Danish	100	[100-100]								2.8	2.8	50.0	16.7	11.1		16.7				
	Import	100	[100-100]							1.2	14.6	12.2	24.4	13.4	6.1		28.0				
Cefoxitin	Danish	72.2	[57.6-86.9]									8.3	19.4	2.8	16.7		52.8				
	Import	19.5	[10.9-28.1]								7.3	32.9	40.2	3.7	8.5		7.3				
Ceftazidime	Danish	100	[100-100]							25.0	5.6	2.8	25.0	36.1	2.8	2.8					
	Import	95.1	[90.5-99.8]						4.9	12.2	29.3	7.3	13.4	15.9	13.4	1.2		2.4			
Chloramphenicol	Danish	5.6	[0-13]										94.4			5.6					
	Import	23.2	[14-32.3]										72.0	4.9	4.9	3.7		14.6			
Ciprofloxacin	Danish	22.2	[8.6-35.8]	55.6	22.2		5.6	2.8			5.6			8.3							
	Import	72.0	[62.2-81.7]	26.8	1.2		4.9	19.5	9.8	4.9	2.4	6.1		24.4							
Colistin	Danish	0	[0-17.4]							100											
	Import	3.7	[0-7.7]							96.3		3.7									
Ertapenem	Danish	11.1	[0.8-21.4]	30.6	52.8	5.6		11.1													
	Import	1.2	[0-3.6]	80.5	15.9	2.4		1.2													
Gentamicin	Danish	0	[0-17.4]						47.2	50.0	2.8										
	Import	11.0	[4.2-17.7]						45.1	36.6	7.3			2.4		8.5					
Imipenem	Danish	0	[0-17.4]				27.8	69.4	2.8												
	Import	0	[0-7.7]				61.0	39.0													
Meropenem	Danish	0	[0-17.4]		94.4	5.6															
	Import	0	[0-7.7]		98.8	1.2															
Sulfonamides	Danish	22.2	[8.6-35.8]										75.0	2.8							22.2
	Import	69.5	[59.5-79.5]										26.8	3.7							69.5
Tetracycline	Danish	16.7	[4.5-28.8]								80.6	2.8					16.7				
	Import	56.1	[45.4-66.8]								42.7	1.2		1.2	3.7		51.2				
Tigecycline	Danish	0	[0-17.4]					94.4	5.6												
	Import	0	[0-7.7]					96.3	3.7												
Trimethoprim	Danish	13.9	[2.6-25.2]					83.3	2.8							13.9					
	Import	50.0	[39.2-60.8]					50.0								50.0					

Vertical solid lines indicate EUCAST epidemiological cut-off values. For *E. coli* , EUCAST ECOFF are not available for all compounds and complementary cutoff's are set for Azithromycin (MIC > 16) and Sulfamethoxazole (MIC > 64). EUCAST clinical breakpoints are indicated as vertical dotted lines if different from the corresponding epidemiological cut-off values

Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

White fields represent the range of dilutions tested. MIC values equal to or lower than the lowest concentration tested are presented as the lowest concentration. MIC values greater than the highest concentration in the range are presented as one dilution step above the range

Table A7.5 Distribution (n, %) of AMR profiles in *Escherichia coli* from broilers (n=124) and broiler meat (Danish n=36; import n=82) recovered by selective enrichment, Denmark

DANMAP 2018

2018 AMR profiles	Broilers	Broiler meat	
	Danish	Danish	Import
AMP AZM CAC CHL CIP CTX FEP GEN NAL SMX TET TMP			1 (1%)
AMP AZM CAC CHL CIP CTX FEP NAL SMX TET TMP			1 (1%)
AMP AZM CAC CIP CTX FEP NAL SMX TMP			1 (1%)
AMP CAC CEC CHL CIP CTX FOX NAL SMX T/C TET TMP			1 (1%)
AMP CAC CEC CHL CTX FOX GEN SMX T/C TET			2 (2%)
AMP CAC CEC CIP CTX ETP FEP FOX NAL SMX T/C TET TMP			1 (1%)
AMP CAC CEC CIP CTX FEP FOX GEN NAL SMX T/C			1 (1%)
AMP CAC CEC CIP CTX FEP FOX NAL SMX T/C TMP			1 (1%)
AMP CAC CEC CIP CTX FEP FOX NAL T/C	1 (1%)		1 (1%)
AMP CAC CEC CIP CTX FOX NAL	3 (2%)		
AMP CAC CEC CIP CTX FOX NAL SMX T/C TET TMP			1 (1%)
AMP CAC CEC CIP CTX FOX NAL T/C	7 (6%)	2 (6%)	1 (1%)
AMP CAC CEC CIP CTX FOX NAL T/C TET	7 (6%)	1 (3%)	
AMP CAC CEC CTX ETP FEP FOX SMX T/C		1 (3%)	
AMP CAC CEC CTX ETP FEP FOX SMX T/C TMP		1 (3%)	
AMP CAC CEC CTX ETP FEP FOX T/C		2 (6%)	
AMP CAC CEC CTX FEP FOX GEN SMX T/C TMP			1 (1%)
AMP CAC CEC CTX FEP FOX SMX T/C TET TMP	3 (2%)	1 (3%)	
AMP CAC CEC CTX FEP FOX T/C	77 (62%)	14 (39%)	3 (4%)
AMP CAC CEC CTX FEP FOX T/C TET	1 (1%)		
AMP CAC CEC CTX FOX SMX T/C	1 (1%)		
AMP CAC CEC CTX FOX T/C	5 (4%)	3 (8%)	1 (1%)
AMP CAC CHL CIP CTX FEP FOX NAL TET TMP		1 (3%)	
AMP CAC CHL CIP CTX FEP GEN NAL			1 (1%)
AMP CAC CHL CIP CTX FEP GEN NAL SMX TMP			2 (2%)
AMP CAC CHL CIP CTX FEP NAL SMX TET TMP			5 (6%)
AMP CAC CHL CIP CTX FEP NAL SMX TMP			2 (2%)
AMP CAC CHL CIP CTX FEP NAL TET TMP	1 (1%)	1 (3%)	
AMP CAC CHL CTX FEP SMX TET			2 (2%)
AMP CAC CHL CTX FEP SMX TET TMP			1 (1%)
AMP CAC CIP CST CTX FEP FOX NAL SMX TMP			1 (1%)
AMP CAC CIP CTX FEP			1 (1%)
AMP CAC CIP CTX FEP FOX NAL SMX TET TMP	1 (1%)		
AMP CAC CIP CTX FEP NAL	2 (2%)	1 (3%)	9 (11%)
AMP CAC CIP CTX FEP NAL SMX		1 (3%)	1 (1%)
AMP CAC CIP CTX FEP NAL SMX TET			6 (7%)
AMP CAC CIP CTX FEP NAL SMX TET TMP	6 (5%)	1 (3%)	13 (16%)
AMP CAC CIP CTX FEP NAL SMX TMP			3 (4%)
AMP CAC CIP CTX FEP NAL TET TMP			1 (1%)
AMP CAC CIP CTX FEP SMX TET			1 (1%)
AMP CAC CST CTX FEP TET			2 (2%)
AMP CAC CTX FEP		3 (8%)	3 (4%)
AMP CAC CTX FEP FOX TMP			1 (1%)
AMP CAC CTX FEP SMX	6 (5%)	2 (6%)	
AMP CAC CTX FEP SMX TET	3 (2%)	1 (3%)	4 (5%)
AMP CAC CTX FEP SMX TET TMP			1 (1%)
AMP CAC CTX FEP SMX TMP			1 (1%)
AMP CHL CIP CTX FEP NAL SMX TET TMP			1 (1%)
AMP CIP CTX FEP GEN NAL SMX TET			1 (1%)
AMP CIP CTX FEP NAL SMX TET TMP			1 (1%)
AMP CTX FEP			1 (1%)
Number of isolates	124	36	82

Note: AMP=Ampicillin; AZI=Azithromycin; CAC=Ceftazidime; CEC=Cefotaxime/clavulansyre; CHL=Chloramphenicol; CIP=Ciprofloxacin; CST=Colistin; CTX=Cefotaxime; ETP=Ertapenem; FEP=Cefepime; FOX=Cefoxitin; GEN=Gentamicin; NAL=Nalidixan; SMX=Sulphamethoxazole; T/C=Ceftazidime/clavulansyre; TET=Tetracycline; TMP=Trimethoprim

Table A7.6 Distibution (number of isolates) of MLST and ESBL/AmpC Enzymes combinations detected in the ESBL/AmpC producing *E. coli* isolates from broilers and broiler meat recoved by selective enrichment, Denmark

DANMAP 2018

		Broilers	Broiler meat	
MLST types	MLST	Danish	Danish	Import
ST10	CMY-2			1
	CTX-M-1			3
	CTX-M-32			1
	TEM-52B			1
	TEM-52C			2
ST23	CTX-M-1			2
ST34	TEM-52C			1
ST38	CMY-2		4	
	SHV-12			1
ST48	CMY-2	1		
	SHV-12			1
ST57	CTX-M-1			1
	SHV-12			1
ST69	CMY-2			1
	SHV-12			1
ST88	CTX-M-1	1		
ST115	TEM-52B			5
ST117	CTX-M-1			1
	SHV-12			6
ST155	CMY-2			1
	CTX-M-1	2		1
	Chromosomal AmpC	1		
ST162	CTX-M-1		1	
	TEM-52B			1
ST189	CMY-2			1
	TEM-52C			2
ST212	CTX-M-1	1		1
ST295	CMY-2	1		
ST350	CTX-M-1			1
ST355	CMY-2			1
ST533	SHV-2			1
ST580	CMY-2	1		
ST602	Chromosomal AmpC			1
ST665	SHV-12			1
ST744	CTX-M-1			1
ST752	CMY-2	1		
	CTX-M-1	3	2	

Table continue next page

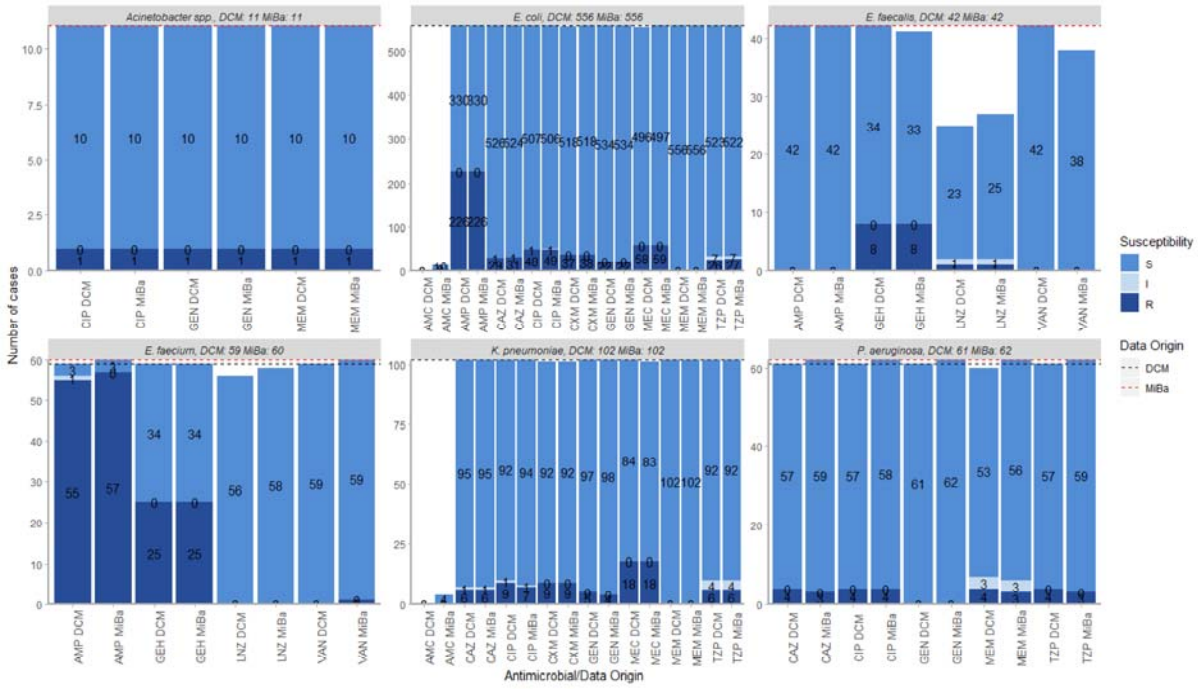
Table A7.6 (Continued) Distibution (number of isolates) of MLST and ESBL/AmpC Enzymes combinations detected in the ESBL/AmpC producing *E. coli* isolates from broilers and broiler meat recoved by selective enrichment, Denmark

DANMAP 2018

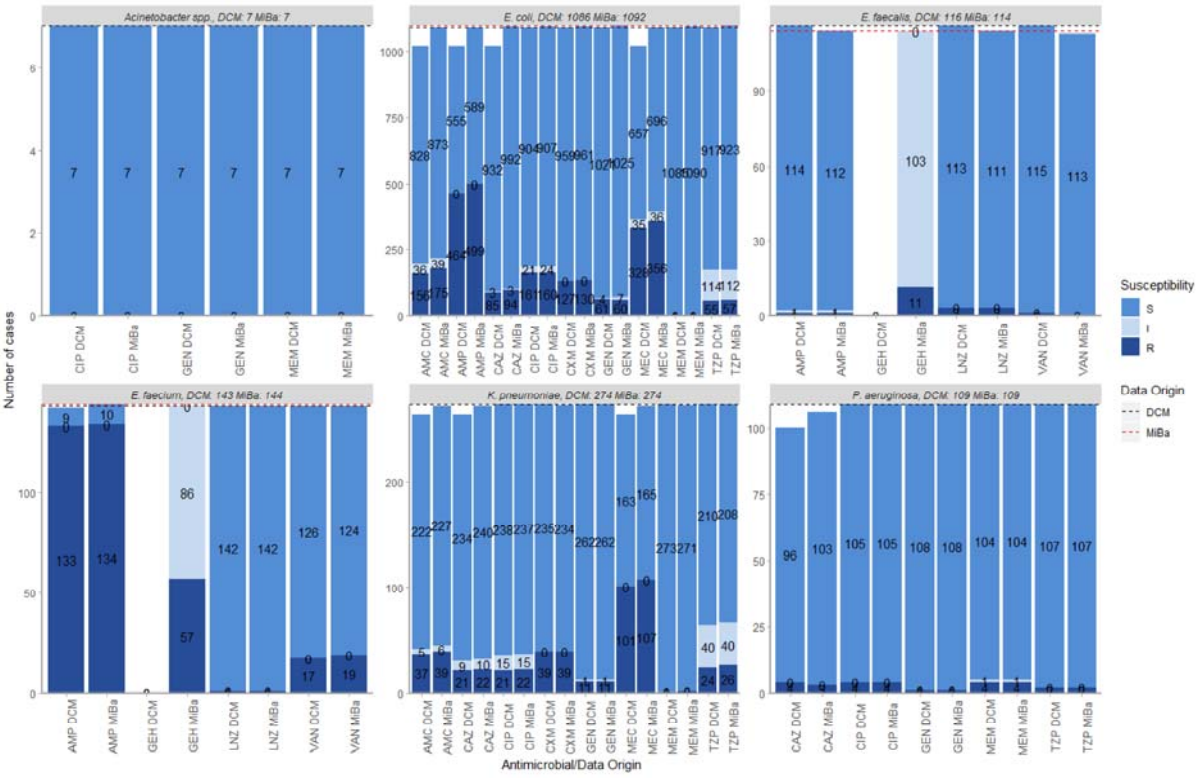
		Broilers	Broiler meat	
MLST types	MLST	Danish	Danish	Import
ST770	CMY-2			1
	CTX-M-14b			1
ST967	TEM-52B			1
ST1011	CTX-M-1			2
	CTX-M-14b			1
	SHV-12	2	1	6
ST1101	CMY-2	1		
ST1112	CMY-2			1
ST1158	TEM-52B			1
ST1163	CTX-M-1			1
ST1196	CTX-M-14		1	1
ST1286	CMY-2	3	1	
ST1564	SHV-12			1
ST1640	CMY-2		1	
	CTX-M-1	2	1	1
ST1706	Chromosomal AmpC			1
ST1771	CTX-M-1			1
ST1818	CTX-M-1	2	1	1
ST2040	CMY-2	43	16	2
ST2223	TEM-52B			1
ST2309	CTX-M-1		3	
ST2334	CTX-M-1			1
ST2705	CTX-M-1			1
ST3165	TEM-52B			1
ST3231	CTX-M-1			1
ST3232	CTX-M-1		1	
ST4243	CMY-2			1
	CTX-M-1			1
ST4512	CTX-M-1			1
ST4663	SHV-12			1
	Chromosomal AmpC	14	1	
ST4994	CMY-2		1	
ST5825	CMY-2	1		
Not available	CMY-98		1	
	CTX-M-1			1
	Unknown			1
	Not available	44		6
Total		124	36	82

Figure A8.1 Invasive cases. Comparisons of S-I-R interpretations per species according to data origin for each DCM

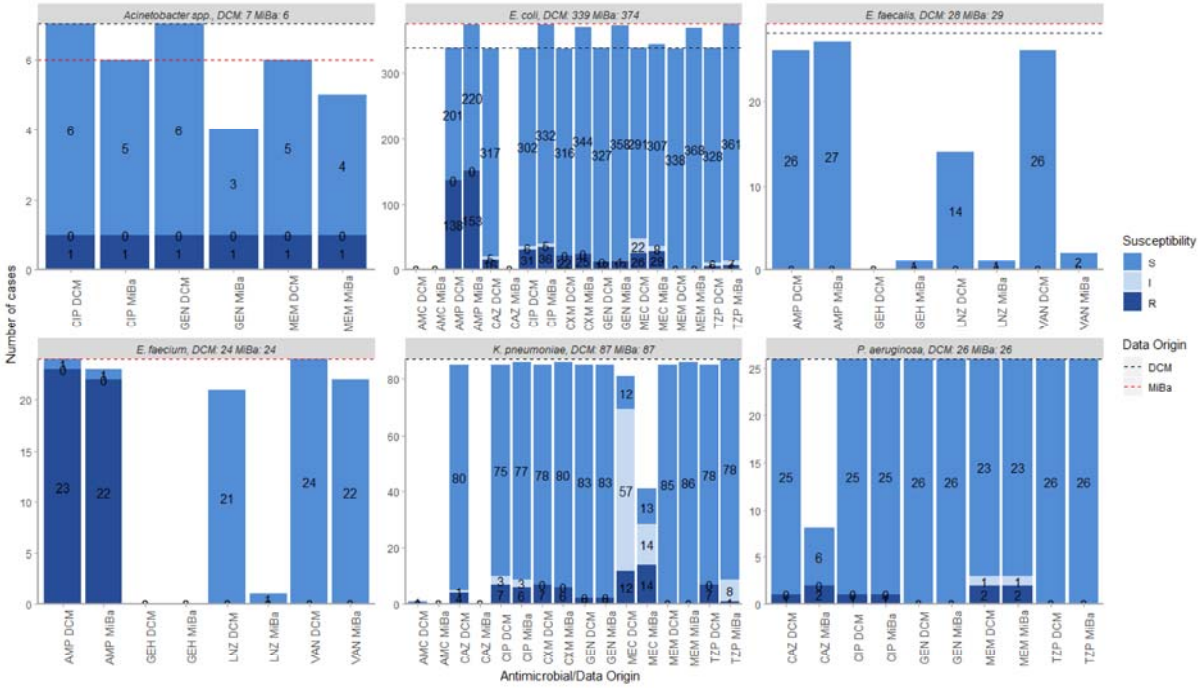
DCM 1



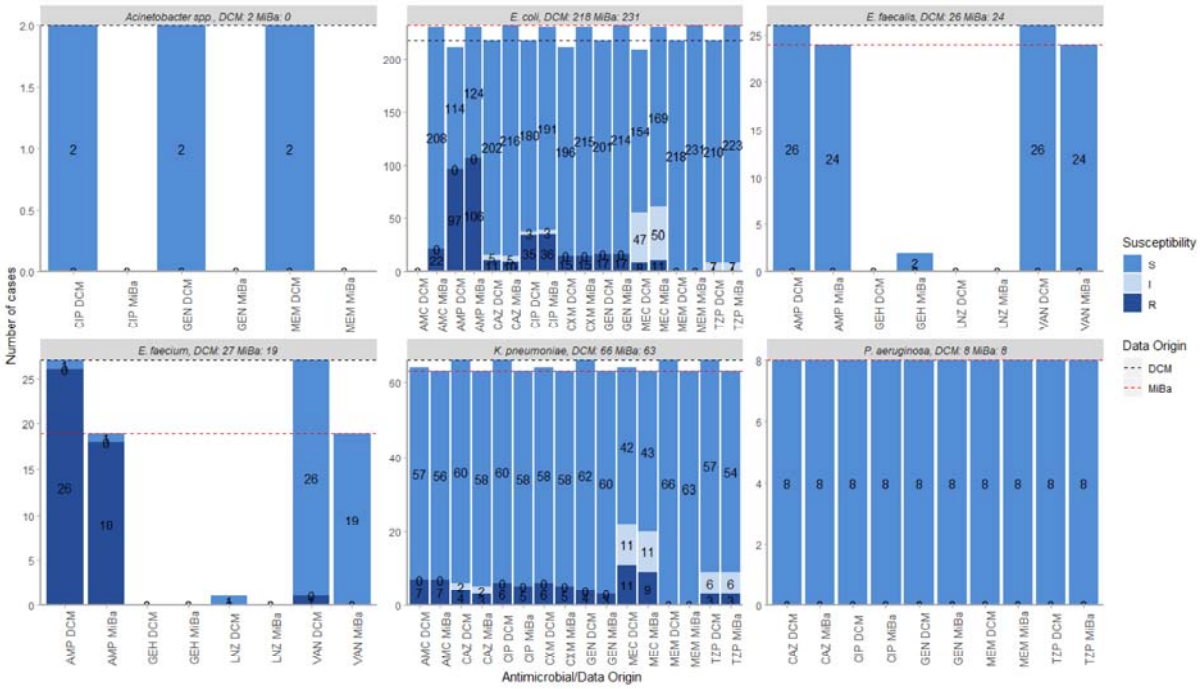
DCM 2



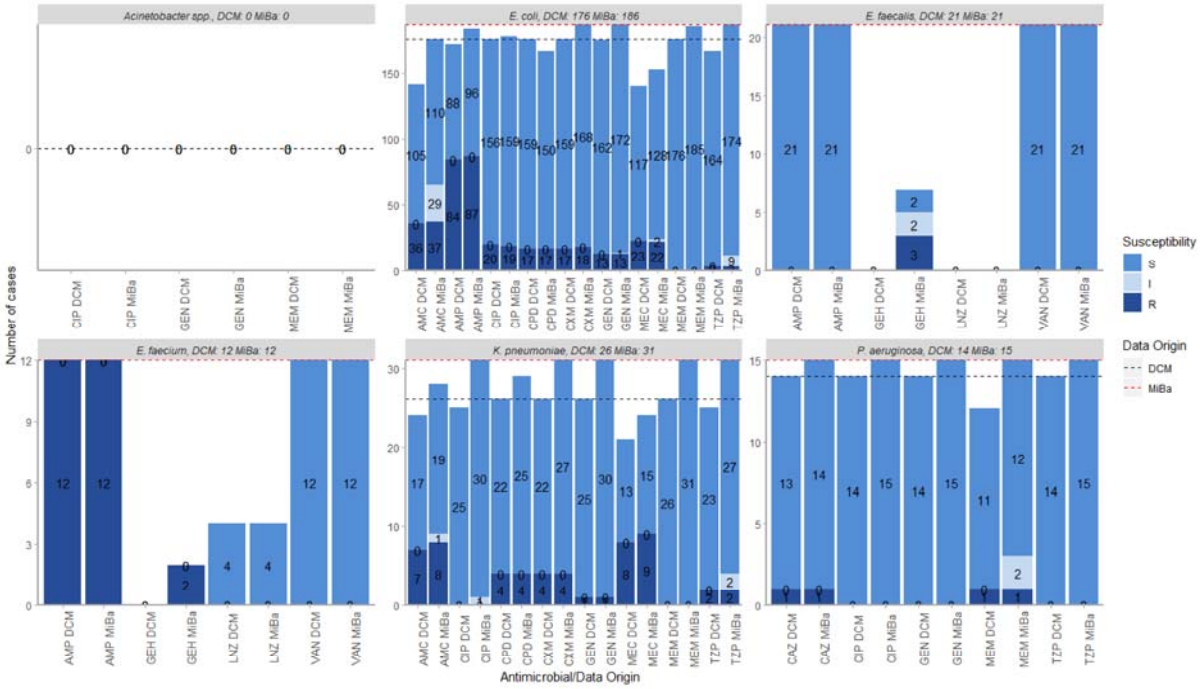
DCM 3


Acinetobacter spp., DCM: 7 MiBa: 6
E. coli, DCM: 339 MiBa: 374
E. faecalis, DCM: 28 MiBa: 29
E. faecium, DCM: 24 MiBa: 24
K. pneumoniae, DCM: 87 MiBa: 87
P. aeruginosa, DCM: 26 MiBa: 26
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

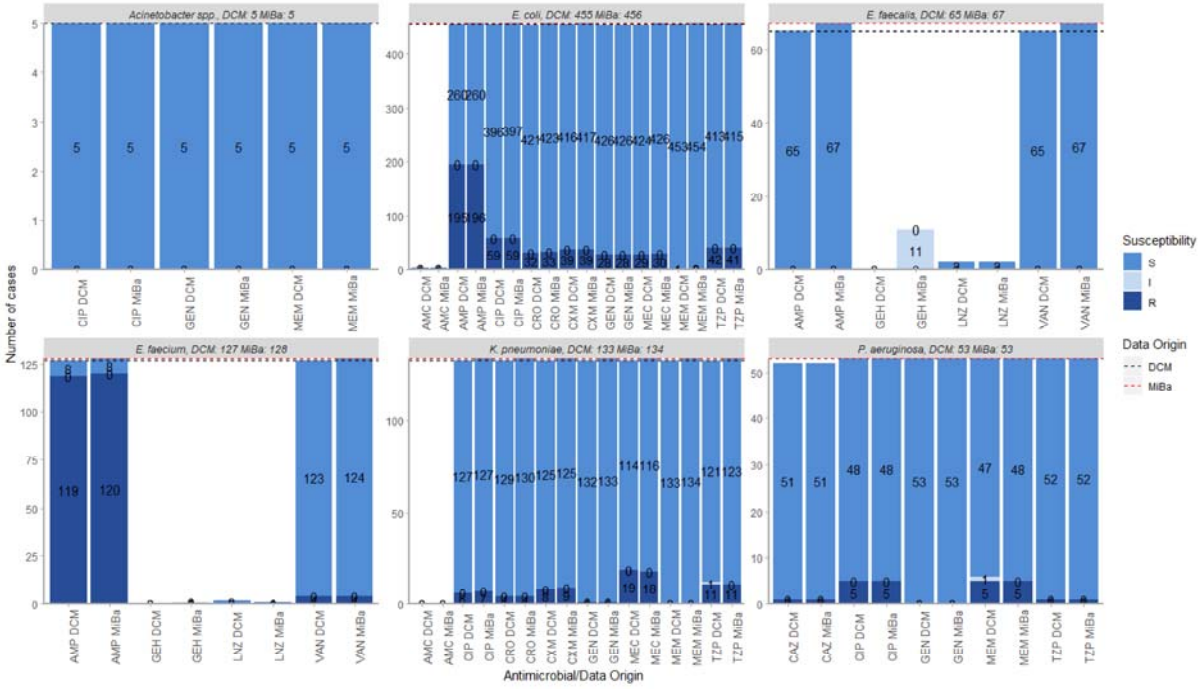
DCM 4


Acinetobacter spp., DCM: 2 MiBa: 0
E. coli, DCM: 218 MiBa: 231
E. faecalis, DCM: 26 MiBa: 24
E. faecium, DCM: 27 MiBa: 19
K. pneumoniae, DCM: 66 MiBa: 63
P. aeruginosa, DCM: 8 MiBa: 8
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

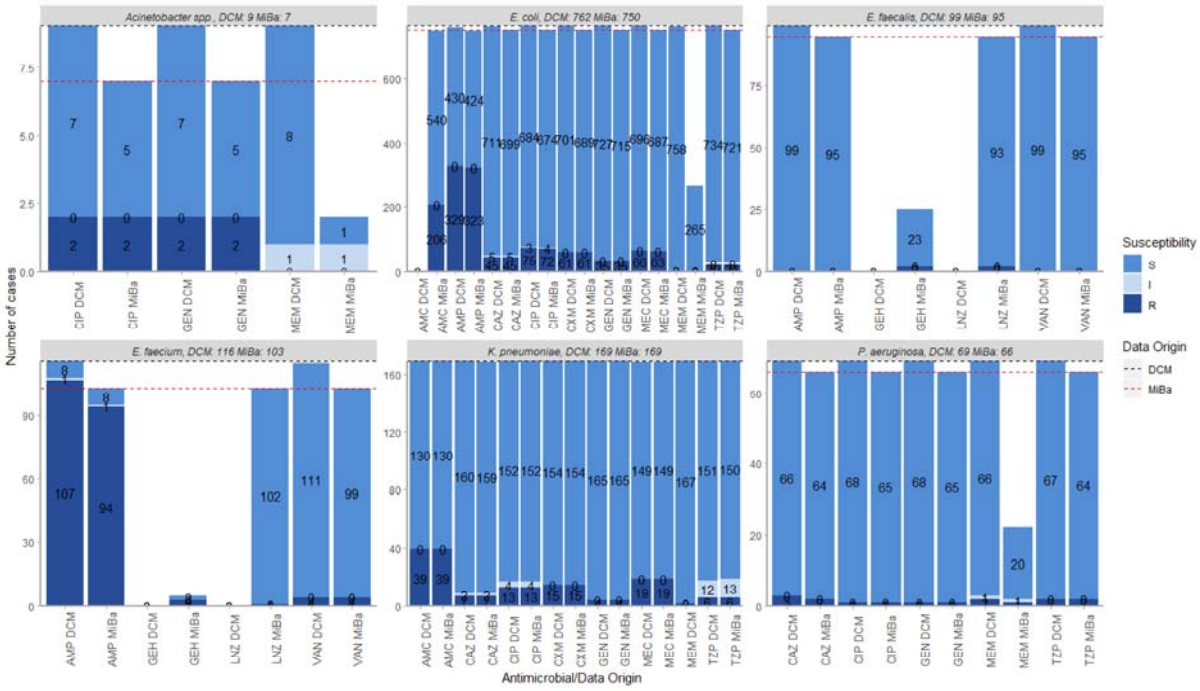
DCM 5


Acinetobacter spp., DCM: 0 MiBa: 0
E. coli, DCM: 176 MiBa: 186
E. faecalis, DCM: 21 MiBa: 21
E. faecium, DCM: 12 MiBa: 12
K. pneumoniae, DCM: 26 MiBa: 31
P. aeruginosa, DCM: 14 MiBa: 15
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

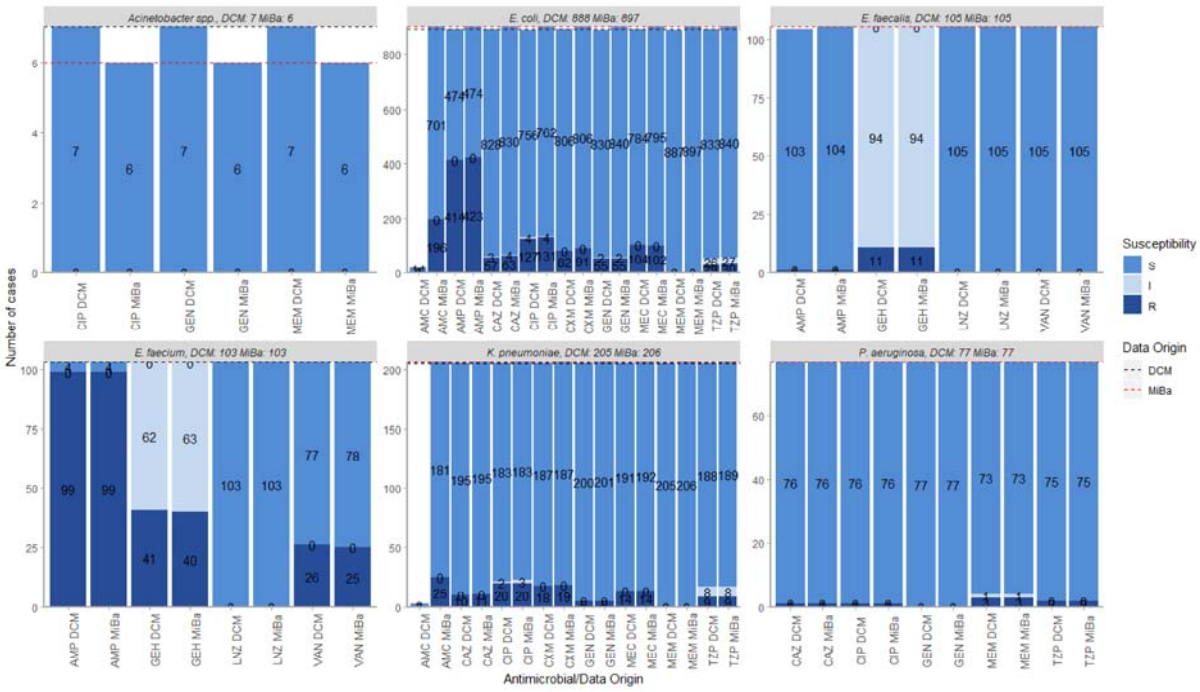
DCM 6


Acinetobacter spp., DCM: 5 MiBa: 5
E. coli, DCM: 455 MiBa: 456
E. faecalis, DCM: 65 MiBa: 67
E. faecium, DCM: 127 MiBa: 128
K. pneumoniae, DCM: 133 MiBa: 134
P. aeruginosa, DCM: 53 MiBa: 53
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

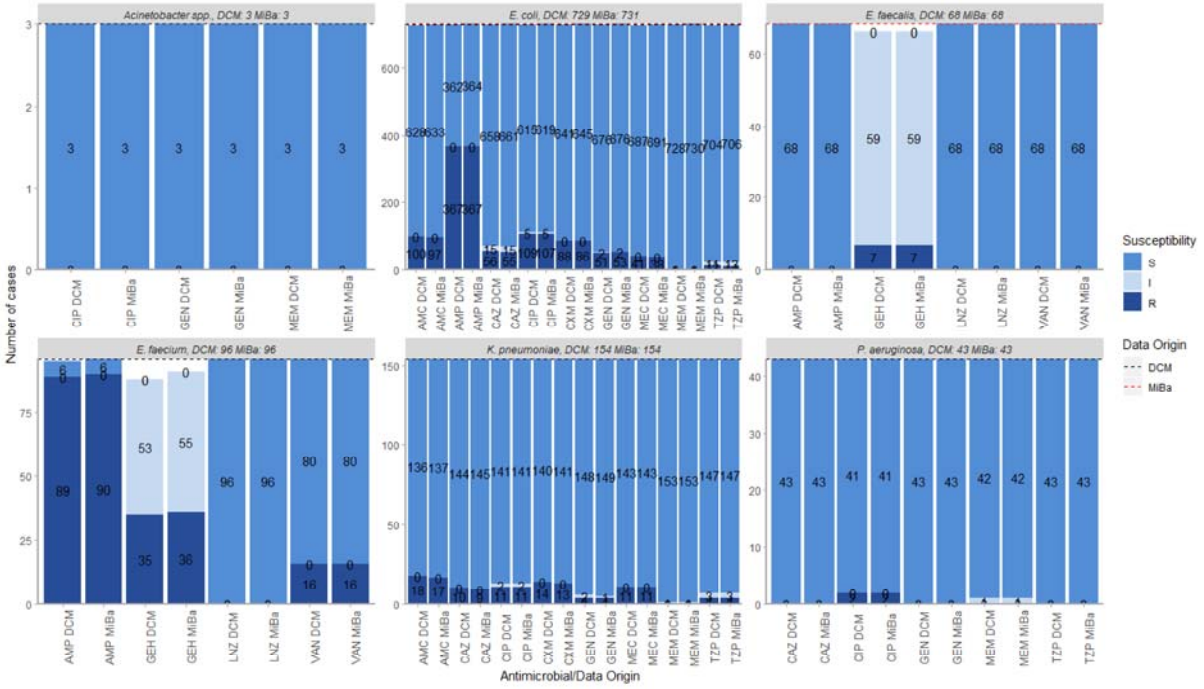
DCM 7


Acinetobacter spp., DCM: 9 MiBa: 7
E. coli, DCM: 762 MiBa: 750
E. faecalis, DCM: 99 MiBa: 95
E. faecium, DCM: 116 MiBa: 103
K. pneumoniae, DCM: 169 MiBa: 169
P. aeruginosa, DCM: 69 MiBa: 66
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

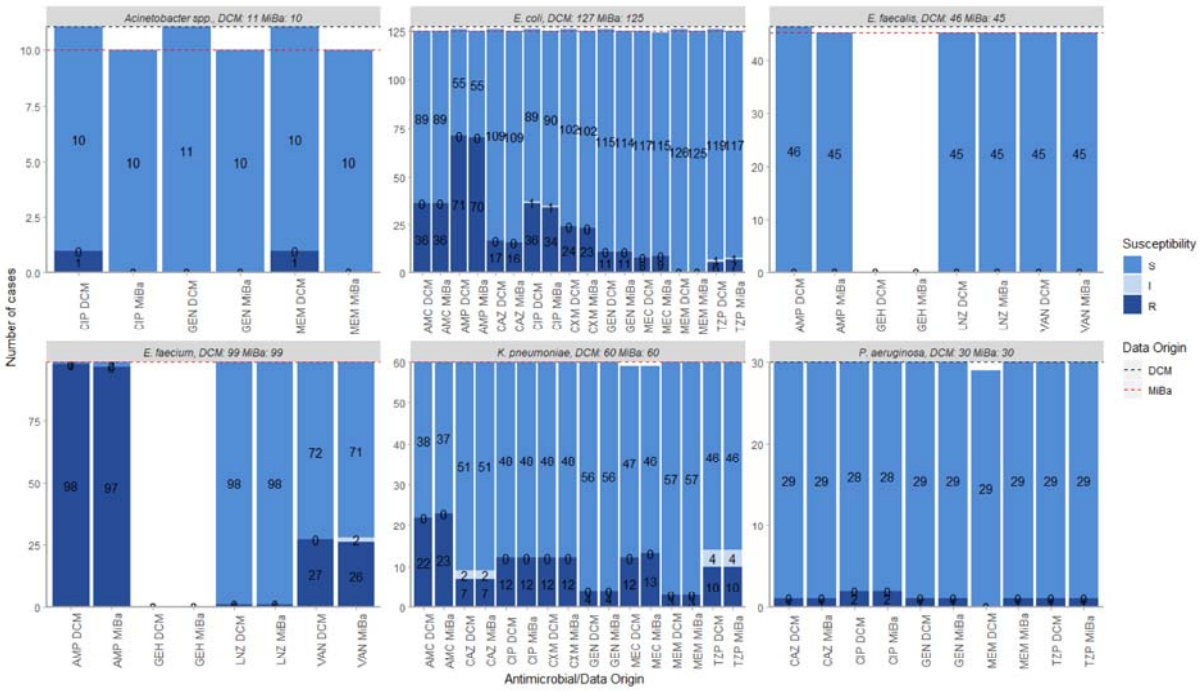
DCM 8


Acinetobacter spp., DCM: 7 MiBa: 6
E. coli, DCM: 888 MiBa: 897
E. faecalis, DCM: 105 MiBa: 105
E. faecium, DCM: 103 MiBa: 103
K. pneumoniae, DCM: 205 MiBa: 206
P. aeruginosa, DCM: 77 MiBa: 77
Number of cases
Antimicrobial/Data Origin
Susceptibility
S
I
R
Data Origin
DCM
MiBa

DCM 9



DCM 10



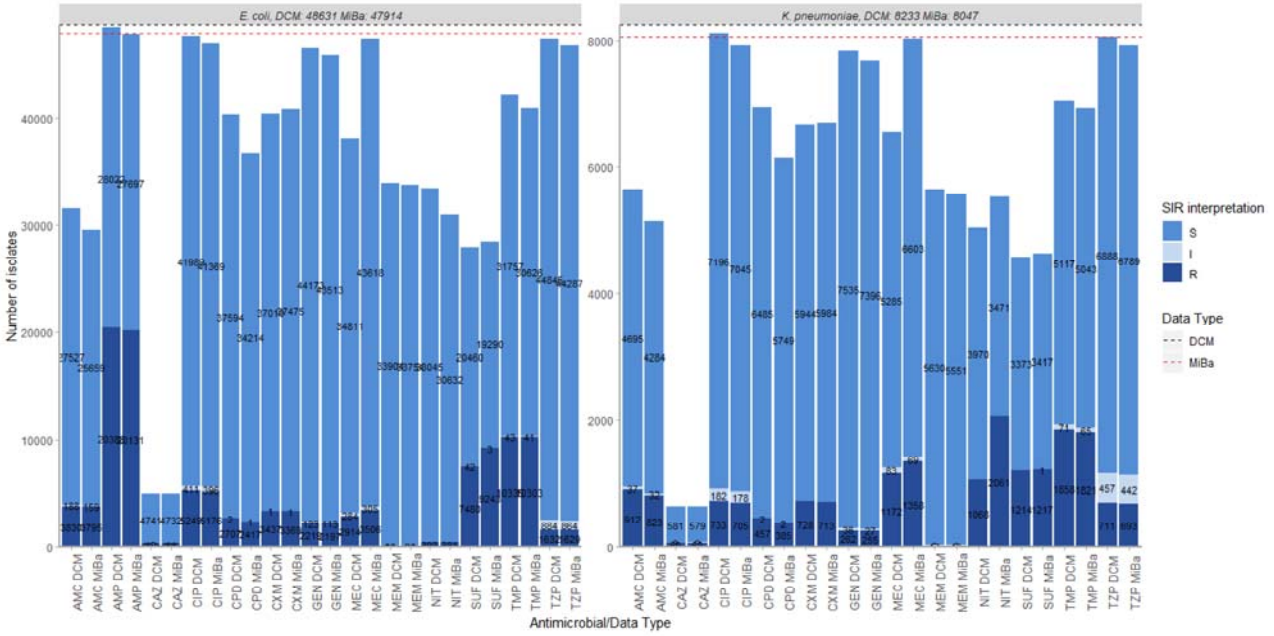
Note: It differs how and if the individual DCMs, for invasive enterococci, register high-level gentamicin resistance (GEH) in MiBa. It also differs whether they register an S-I-R interpretation or just the zone diameter/MIC without an S-I-R interpretation. In all cases: R always refer to high-level gentamicin resistance positive (isolates with gentamicin zone diameter <8 mm or a MIC >128 mg/L), and S or I always refer to high-level gentamicin resistance negative (isolates with gentamicin zone diameter ≥8 mm or a MIC ≤128 mg/L).

Glossary: AMC = Amoxicillin/clavulanate, AMP = Ampicillin, CAZ = Ceftazidime, CIP = Ciprofloxacin, CPD = Cefpodoxime, CRO = Ceftriaxone, CTX = Cefotaxime, CXM = Cefuroxime, GEN = Gentamicin, GEH = High-level gentamicin resistance, LNZ = Linezolid, MEC = Mecillinam, MEM = Meropenem, TZP = Piperacillin/tazobactam, VAN = Vancomycin

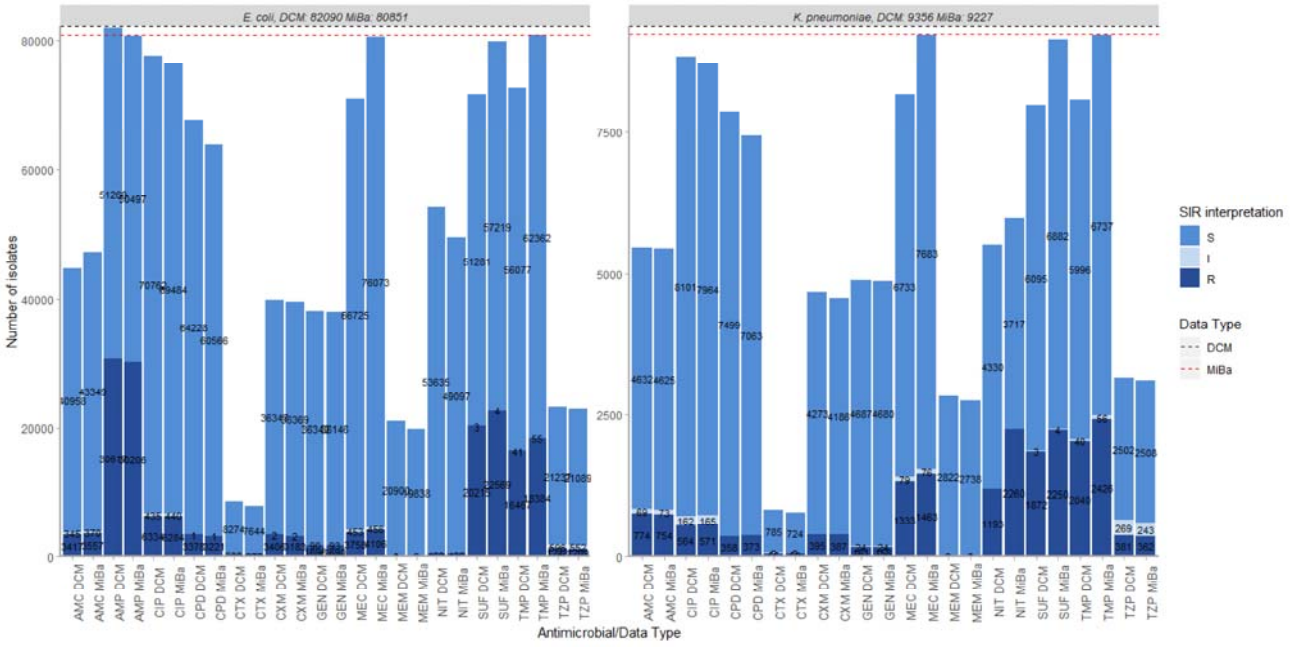
DCM = Department of Clinical Microbiology, MiBa = The Danish Microbiology Database

A8.2 Comparisons of total numbers and S-I-R interpretations for urinary *E. coli* and *K. pneumoniae* for all 10 DCMs added together

Hospital urines



Primary health care urines



Glossary: AMC = Amoxicillin/clavulanate, AMP = Ampicillin, CAZ = Ceftazidime, CIP = Ciprofloxacin, CPD = Cefpodoxime, CTX = Cefotaxime, CXM = Cefuroxime, GEN = Gentamicin, MEC = Mecillinam, MEM = Meropenem, NIT = Nitrofuratoin, SUF = Sulfonamide, TMP = Trimethoprim, TZP = Piperacillin/tazobactam

DCM = Department of Clinical Microbiology, MiBa = The Danish Microbiology Database