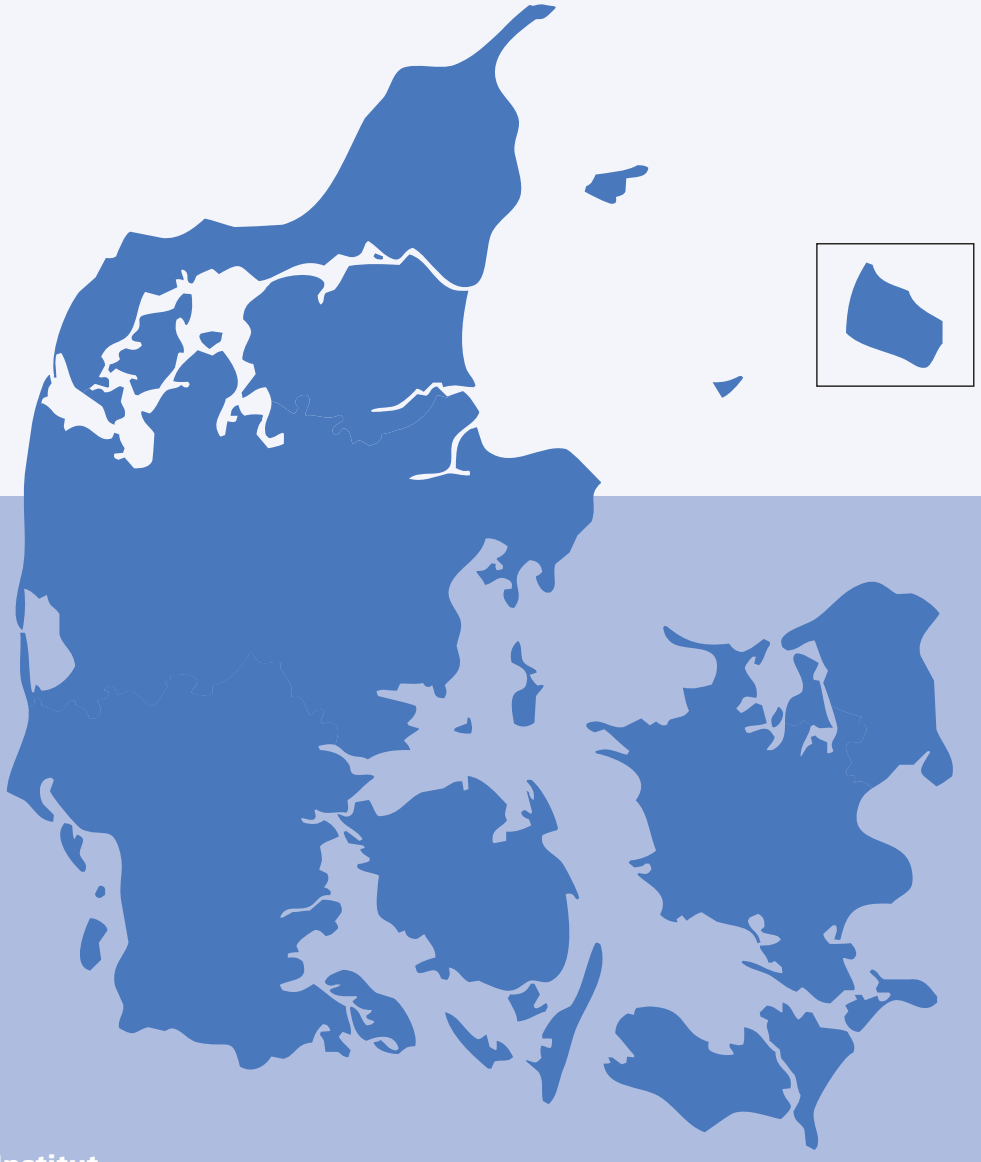
Web annex

DANMAP 2017

DANMAP 2017 - Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark



Statens Serum Institut
National Veterinary Institute, Technical University of Denmark
National Food Institute, Technical University of Denmark

Table A4.1. Consumption of antimicrobial agents for systemic use in pigs given as defined animal daily doses (DADDs), Denmark

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Therapeutic group	Aminoglycosides	Aminoglycosides GI	Amphenicols	Cephalosporins	Colistin GI	Fluoroquinolones	Lincosamider/ Spectinomycin	Macrolides	Penicillin/ Streptomycin	Penicillin's, b-lactamase sensitive	Penicillin's, others(a)	Pleuromutilins	Sulfonamide/ trimethoprim(b)	Tetracyclines	Total
Year	breeding animals/piglets (1000's DADD for 200 kg)														
2004	5	210	18	114	36	3	580	772	671	2302	1111	903	1277	1205	9207
2005	5	162	20	132	35	4	571	769	662	2399	1082	741	1378	1267	9227
2006	6	146	18	149	36	7	538	825	646	2380	1078	825	1434	1217	9306
2007	6	144	22	244	47	6	612	1357	664	2598	1269	1138	1572	1657	11338
2008	7	28	20	300	58	0	556	1272	633	2654	1220	1688	1637	1580	11650
2009	10	36	52	219	86	0	530	1383	685	2864	1432	1559	2036	1664	12556
2010	13	40	73	114	102	0	444	1325	693	2792	1491	1141	2100	1488	11817
2011	11	40	101	3	85	7	317	1032	605	2403	1248	517	1760	1055	9183
2012	12	55	89	1	86	9	287	1187	601	2409	1197	495	1771	1132	9330
2013	17	65	142	5	89	15	296	1397	569	2602	1177	666	1814	1257	10111
2014	19	57	134	4	130	6	311	1427	570	2580	1151	433	1697	1239	9758
2015	2	64	166	0	147	0	287	1371	565	2496	1174	584	1583	1137	9576
2016	9	67	171	0	153	0	281	1438	503	2441	1130	718	1463	1002	9377
2017	15	92	185	1	52	0	296	1589	461	2508	1158	536	1437	749	9080
Year	Weaner pigs (1000's DADD for 19 kg)														
2004	1	16814	223	209	3615	6	16840	41083	2433	3290	11079	18166	4409	35090	153259
2005	1	15504	151	211	3182	4	14480	39092	2831	3368	9622	19625	4897	38808	151776
2006	2	15320	76	230	3351	9	12562	37860	2770	3180	7930	18591	3708	45391	150981
2007	1	8404	106	320	4212	0	12818	45094	2714	3533	7861	16412	3322	59020	163819
2008	2	2245	221	316	5326	0	13132	43283	2728	3278	7718	23052	3614	62154	167068
2009	1	2326	138	284	5444	0	14125	49534	2984	3642	9433	29454	3688	71885	192939
2010	0	1702	146	143	6395	0	13108	47147	3156	3749	8907	30550	3074	66451	184529
2011	1	1785	138	4	5166	0	10742	36920	2900	3565	7582	21658	2391	56286	149139
2012	0	1665	135	19	5621	5	12605	42454	2950	3527	7995	22299	2883	64875	167034
2013	0	2273	166	27	5391	0	12432	42426	2951	3789	9119	25363	4915	66107	174959
2014	0	2147	212	32	8738	0	11399	38800	3191	3966	9773	24049	4688	60332	167327
2015	0	1570	457	10	10643	0	11198	38214	3487	4243	10132	23540	3968	56692	164155
2016	0	1303	638	3	11154	0	11333	39325	3232	3740	11687	21910	3714	55304	163342
2017	1	6053	594	0	4012	0	14324	49734	3389	4298	13169	23276	3847	37933	160629
Year	Finisher pigs (1000's DADD for 70 kg)														
2004	0	114	62	46	16	3	3238	8912	284	4948	2073	6963	176	10600	37437
2005	0	182	50	46	54	1	3055	8785	298	5542	1950	8080	179	11072	39294
2006	0	160	47	38	23	1	2593	7637	214	5677	1667	7202	117	12179	37554
2007	0	79	28	40	15	0	2308	7869	164	5720	1770	5767	124	13298	37182
2008	0	4	24	38	31	0	1911	7704	113	5411	1121	8817	110	12575	37858
2009	0	9	22	28	22	0	1956	9100	95	5895	1196	10334	89	13226	41972
2010	0	29	16	16	22	0	1954	9145	157	6469	1232	11204	86	12843	43173
2011	0	5	60	2	11	0	1762	6667	166	5796	883	8509	100	10712	34673
2012	0	3	8	1	13	0	1694	7236	195	5508	990	8401	132	11167	35349
2013	0	4	14	1	7	0	1541	6477	143	5678	1012	10019	240	11942	37077
2014	0	2	13	1	43	0	1423	6264	106	5698	828	9111	172	10656	34315
2015	0	0	27	2	67	0	1324	5457	87	5898	724	8287	120	9035	31029
2016	0	0	14	1	36	0	1136	5476	63	5270	673	8118	152	8035	28974
2017	0	6	13	1	18	0	1215	6272	73	5279	650	8255	129	5377	27288
Year	Age group not given (1000's DADD for 50 kg)														
2004	1	97	12	7	15	3	318	915	42	395	221	647	103	769	3545
2005	1	61	6	7	20	0	237	624	39	334	199	497	114	641	2778
2006	0	83	3	6	23	0	174	520	28	293	192	445	106	725	2599
2007	0	36	1	11	25	0	157	302	21	203	92	329	70	556	1802
2008	0	7	1	9	34	0	78	216	8	126	89	248	55	366	1239
2009	0	2	0	10	22	0	66	207	9	104	76	184	43	220	941
2010	0	3	0	3	7	0	31	121	11	35	29	78	15	82	415
2011	0	0	0	0	0	0	1	10	0	1	2	3	3	7	27
2012	0	0	0	0	0	0	2	2	0	1	0	1	0	3	10
2013	0	0	0	0	0	0	0	0	0	3	3	0	1	3	10
2014	0	0	0	0	2	0	0	0	0	1	2	0	0	2	7
2015	0	0	0	0	0	0	2	1	0	1	3	0	0	1	9
2016	0	0	0	0	0	0	0	2	0	0	1	0	0	0	2
2017	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2

Note: DADD for pigs is defined as the standard dose necessary for treating a pig of average weight in the age group (breeding animals = 200 kg, weaners = 19kg and finishers = 70 kg). Where the age group was not specified a weight of 50 kg was assumed.

a) Data includes sales from pharmacies, feed mills and veterinary practice. Local intrauterine, intramammary and topical treatment is not included

b) Includes a small proportion of combinations with aminopenicillin and clavulanic acid.

c) 3rd and 4th generation cephalosporins.

Figure A5.2.1 Distribution of DIDs between primary health care and hospital care, Denmark

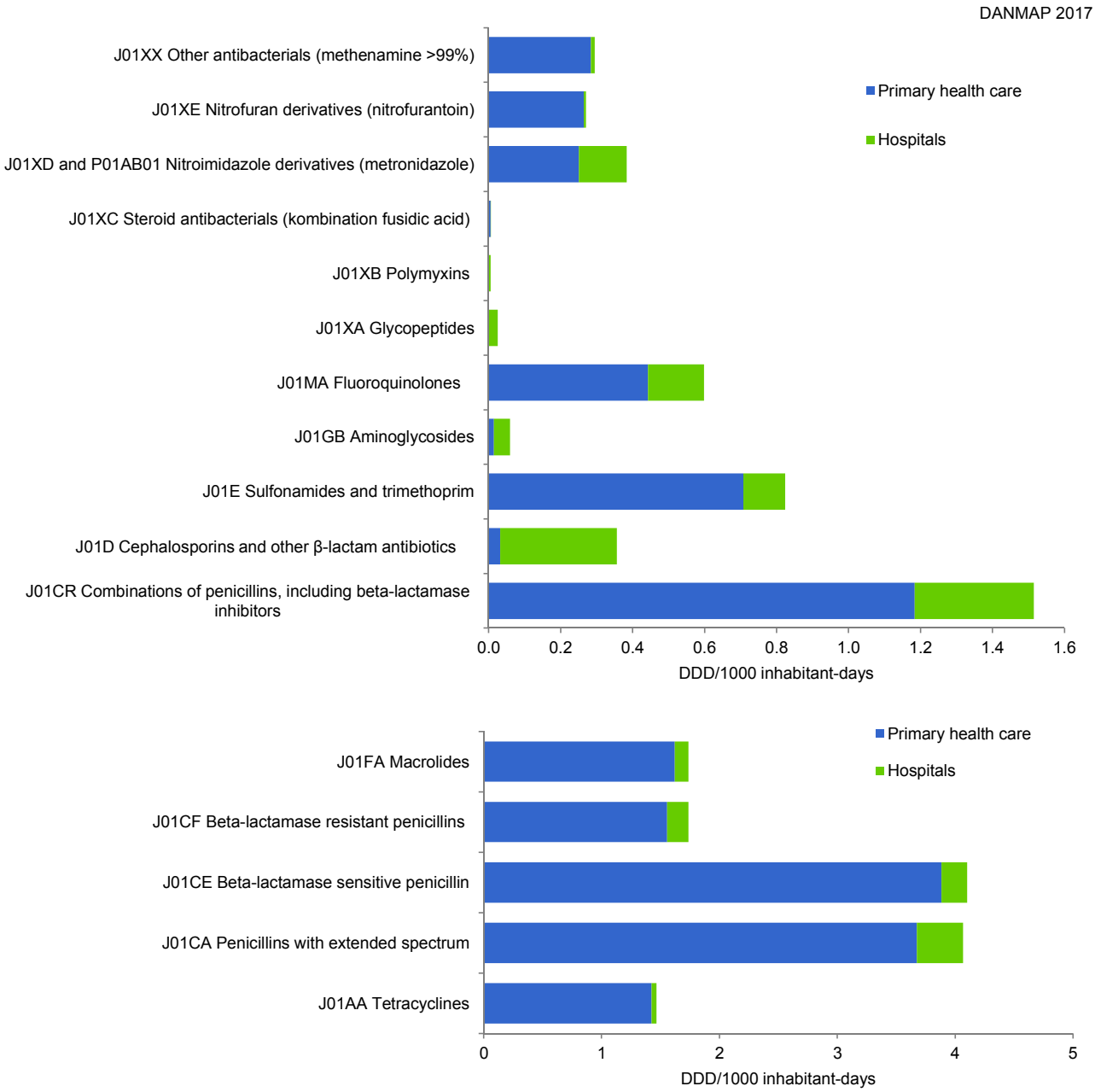


Table A5.2.1 Total Consumption of antimicrobial agents for systemic use in humans (kg active substance), Denmark

DANMAP 2017

ATC group	Therapeutic group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
J01AA	Tetracyclines	1,782	1,908	2,016	2,196	2,214	2,253	2,016	1,791	1,740	1,650
J01CA	Penicillins with extended spectrum	6,103	6,103	6,344	6,385	6,004	6,001	6,046	6,206	6,250	6,511
J01CE	Beta-lactamase sensitive penicillins	22,560	21,763	22,312	22,668	20,282	20,223	19,195	19,020	18,463	17,532
J01CF	Beta-lactamase resistant penicillins	5,218	5,274	5,438	5,713	5,667	6,126	6,423	6,522	6,920	7,291
J01CR	Comb. of penicillins, including beta-lactamase inhibitors	1,659	2,250	3,090	4,251	6,000	7,028	8,118	9,097	9,422	8,016
J01D	Cephalosporins and related substances	2,077	2,155	2,120	2,589	2,409	2,209	1,949	1,860	1,701	1,936
J01EA	Trimethoprim and derivatives	404	399	418	414	430	442	464	468	473	477
J01EB	Short-acting sulfonamides	2,307	2,222	2,165	1,992	1,860	1,838	1,730	1,479	1,383	1,265
J01EE	Comb. of sulfonamides and trimethoprim, including derivatives	238	209	169	251	277	357	385	406	409	421
J01FA	Macrolides	2,555	2,416	2,528	2,592	2,175	1,892	1,773	1,709	1,703	1,542
J01FF	Lincosamides	104	124	134	148	157	176	173	177	186	190
J01G	Aminoglycosides	25	23	24	27	31	30	23	23	26	30
J01MA	Fluoroquinolones	1,212	1,231	1,322	1,322	1,283	1,237	1,194	1,172	1,123	1,043
J01XA	Glycopeptides	65	86	90	107	108	111	98	90	89	106
J01XC	Steroid antibacterials (fusidic acid)	64	62	65	55	48	41	37	31	27	20
J01XD	Imidazoles	246	260	258	260	269	270	289	268	282	288
J01XE	Nitrofuran derivatives (nitrofurantoin)	193	201	208	208	205	202	199	189	182	113
J01XX05	Methenamine	1,090	1,048	1,078	1,053	1,040	993	993	1,043	1,131	1,197
J01XX08+09	Linezolid, daptomycin	14	14	14	17	18	20	19	24	20	20
P01AB01	Nitroimidazole derivatives	1,192	1,280	1,323	1,352	1,353	1,332	1,336	1,346	1,344	1,225
A07AA09	Intestinal antiinfectives (vancomycin)	13	20	29	43	47	47	48	42	43	45
J01, P01AB01 and A07AA09	Antibacterial agents (total)	49,130	49,059	51,158	53,659	51,890	52,843	52,521	52,977	52,933	50,925

Figure A5.4.1 Total somatic hospital consumption (DBD) by leading groups of antimicrobial agents (J01), 2008-2017, Denmark

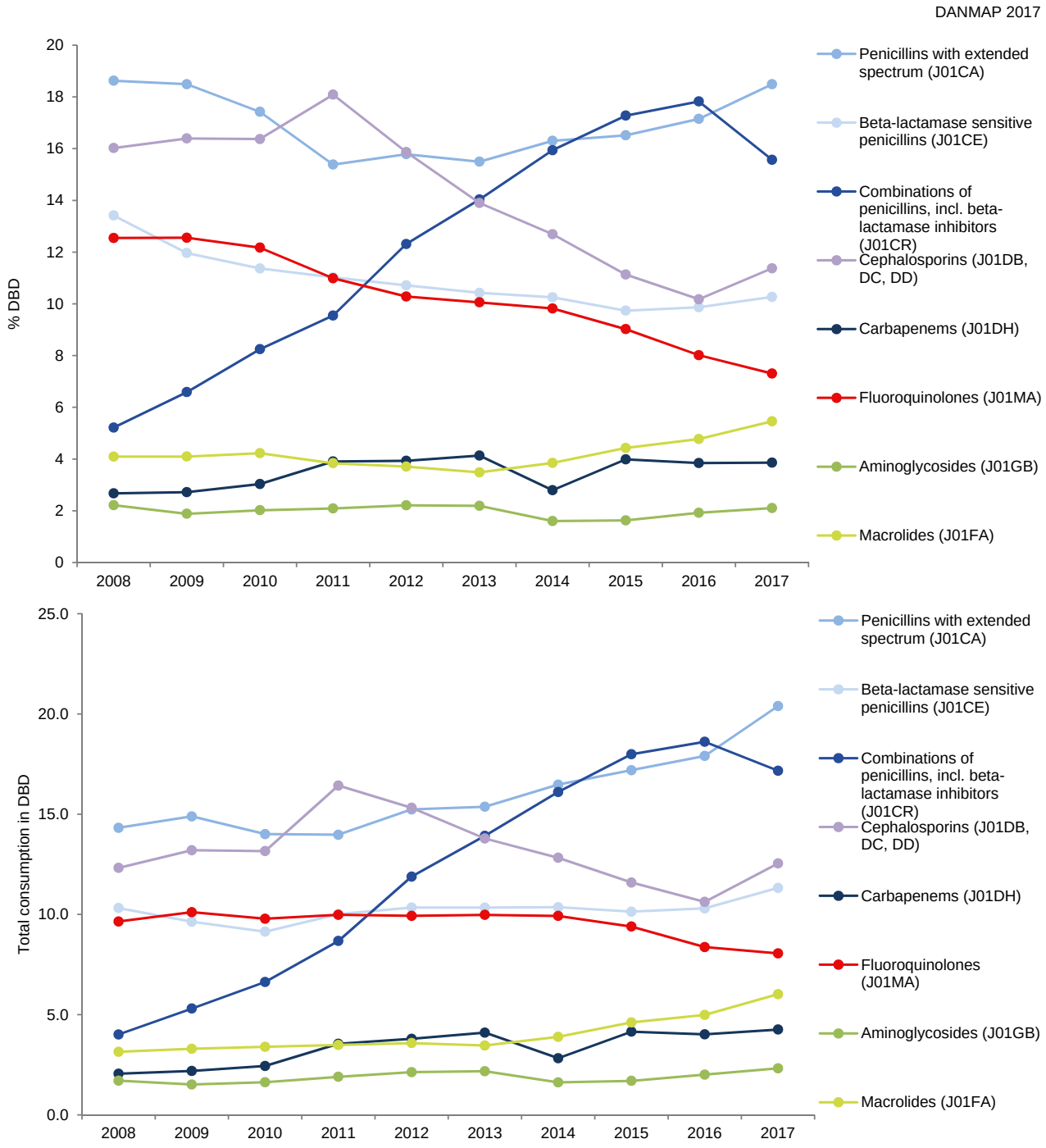


Table A5.4.1 Consumption of antimicrobial agents for systemic use in hospital care (DDD/1000 inhabitant-days), Denmark

DANMAP 2017

ATC group[(a)]	Therapeutic group	Year									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
J01AA	Tetracyclines	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.04
J01CA	Penicillins with extended spectrum	0.35	0.35	0.32	0.31	0.33	0.32	0.34	0.35	0.35	0.39
J01CE	Beta-lactamase sensitive penicillins	0.25	0.23	0.21	0.22	0.22	0.22	0.22	0.20	0.20	0.22
J01CF	Beta-lactamase resistant penicillins	0.18	0.17	0.17	0.18	0.19	0.20	0.20	0.20	0.18	0.18
J01CR	Combinations of penicillins, incl. beta-lactamase inhibitors	0.10	0.13	0.15	0.19	0.26	0.29	0.33	0.36	0.36	0.33
J01DB	First-generation cephalosporins	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
J01DC	Second-generation cephalosporins	0.27	0.28	0.28	0.33	0.30	0.27	0.24	0.21	0.19	0.21
J01DD	Third-generation cephalosporins	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
J01DF	Monobactams	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
J01DH	Carbapenems	0.05	0.05	0.06	0.08	0.08	0.09	0.06	0.08	0.08	0.08
J01EA	Trimethoprim and derivatives	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
J01EB	Short-acting sulfonamides	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
J01EE	Combinations of sulfonamides and trimethoprim, incl. derivatives	0.06	0.05	0.04	0.06	0.07	0.09	0.10	0.10	0.10	0.10
J01FA	Macrolides	0.08	0.08	0.08	0.08	0.08	0.07	0.08	0.09	0.10	0.12
J01FF	Lincosamides	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
J01GB	Aminoglycosides	0.04	0.04	0.04	0.04	0.05	0.05	0.03	0.03	0.04	0.04
J01MA	Fluoroquinolones	0.24	0.24	0.22	0.22	0.21	0.21	0.21	0.19	0.16	0.16
J01XA	Glycopeptides	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03
J01XB	Polymyxins	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
J01XC	Steroid antibacterials (fusidic acid)	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
J01XD	Imidazol derivatives	0.08	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09
J01XE	Nitrofuran derivatives (nitrofurantoin)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
J01XX	Other antibacterials	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
P01AB01	Nitroimidazole derivatives (metronidazole)	0.06	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04
A07AA09	Intestinal antiinfectives (vancomycin)	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
J01	Antibacterial agents for systemic use (total)	1.89	1.90	1.85	2.00	2.07	2.10	2.10	2.09	2.04	2.13

a) From the 2018 edition of the Anatomical Therapeutic Chemical (ATC) classification system

Figure A5.4.2 Number of bed-days and admissions in somatic hospitals, Denmark

DANMAP 2017

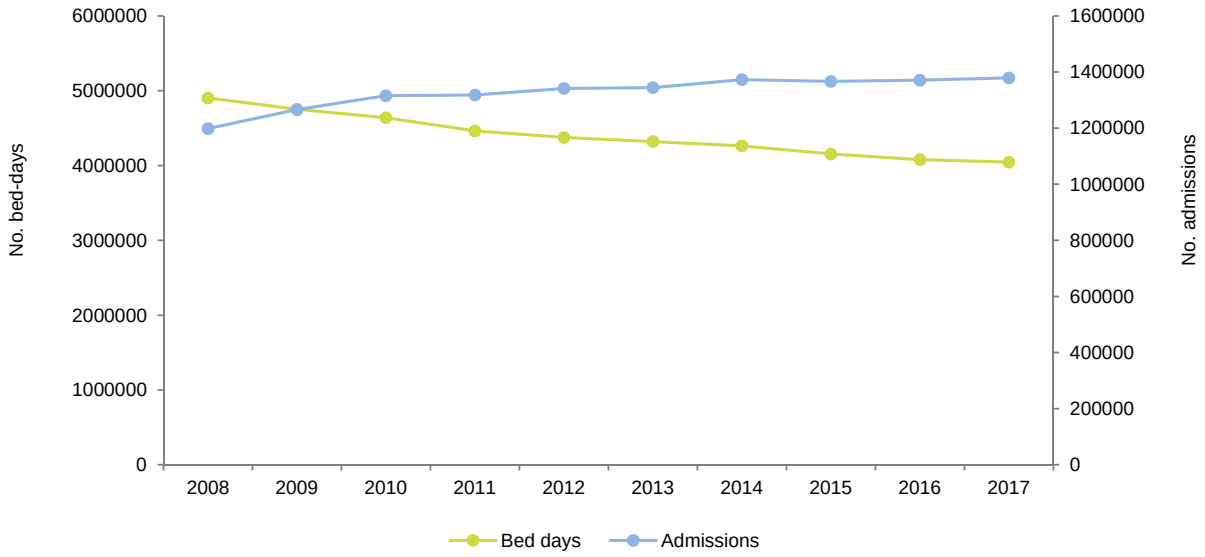


Table A5.4.2 DDD, admission-days and bed-days in Danish hospitals

DANMAP 2017

	2008	2012	2017
DDD used in the hospital sector (J01X, A07AA09, P01AB01)	3,770,307	4,223,740	4,462,109
Admission-days	1,198,298	1,341,400	1,379,113
Bed-days	4,903,358	4,375,390	4,046,115

Figure A5.4.3 Types of antibiotic formulations used in danish hospitals in DDD, and total number of antibiotics

DANMAP 2017

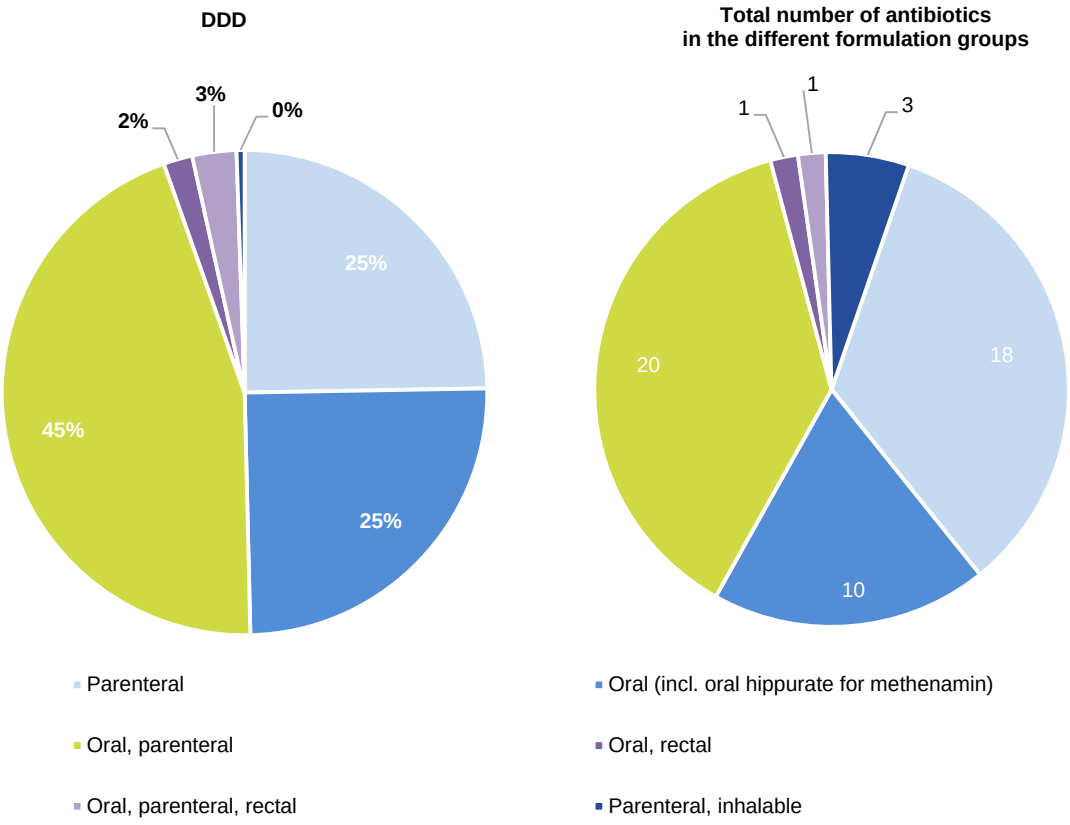


Table A6.1 Distribution of MICs and resistance (%) in Salmonella Typhimurium from pigs (n=21), Denmark

DANMAP 2017

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
Tetracycline	71.4	[52.1-90.8]								23.8	4.8				71.4					
Tigecycline	0	[0-29.3]					90.5	4.8	4.8											
Chloramphenicol	4.8	[0-13.9]										95.2				4.8				
Ampicillin	47.6	[26.3-69]							28.6	19.0	4.8				47.6					
Cefotaxime	0	[0-29.3]					95	4.8												
Ceftazidime	0	[0-29.3]						100												
Meropenem	0	[0-29.3]		95.2	4.8															
Trimethoprim	9.5	[0-22.1]					90.5							9.5						
Sulfonamide	52.4	[31-73.7]										47.6							52.4	
Azithromycin	0	[0-29.3]									90.5	4.8	4.8							
Gentamicin	5	[0-13.9]						85.7	9.5			4.8								
Ciprofloxacin	0	[0-29.3]	33.3	61.9	4.8															
Nalidixic acid	0	[0-29.3]									76.2	19.0	4.8							
Colistin	0	[0-29.3]							100											

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 A6.2 Distribution of MICs and resistance (%) in Salmonella Typhimurium from pork (n=43), Denmark

DANMAP 2017

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
Tetracycline	62.8	[48.3-77.2]								34.9	2.3			7.0	55.8					
Tigecycline	0	[0-14.6]					69.8	25.6	4.7											
Chloramphenicol	18.6	[7-30.2]										76.7	4.7		4.7	14.0				
Ampicillin	76.7	[64.1-89.4]							11.6	11.6					76.7					
Cefotaxime	0	[0-14.6]					97.7	2.3												
Ceftazidime	0	[0-14.6]						97.7	2.3											
Meropenem	0	[0-14.6]		88.4	11.6															
Trimethoprim	11.6	[2-21.2]					86.0	2.3						11.6						
Sulfonamide	81.4	[69.8-93]										14.0		2.3	2.3				81.4	
Azithromycin	2.3	[0-6.8]									18.6	72.1	7.0		2.3					
Gentamicin	11.6	[2-21.2]						83.7	2.3	2.3		4.7	2.3	4.7						
Ciprofloxacin	0	[0-14.6]	20.9	74.4	4.7															
Nalidixic acid	0	[0-14.6]									88.4	11.6								
Colistin	0	[0-14.6]							97.7	2.3										

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 A6.3 Distribution of MICs and resistance (%) in Salmonella Derby from pigs (n=21), Denmark

DANMAP 2017

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
Tetracycline	38.1	[17.3-58.9]								61.9					38.1					
Tigecycline	0	[0-29.3]					100													
Chloramphenicol	0.0	[0-29.3]										100								
Ampicillin	14.3	[0-29.3]							47.6	38.1					14.3					
Cefotaxime	0	[0-29.3]					100													
Ceftazidime	0	[0-29.3]						95.2	4.8											
Meropenem	0	[0-29.3]		100																
Trimethoprim	19.0	[2.3-35.8]					81.0							19.0						
Sulfonamide	19.0	[2.3-35.8]										81.0							19.0	
Azithromycin	5	[0-13.9]									57.1	38.1			4.8					
Gentamicin	0	[0-29.3]						95.2	4.8											
Ciprofloxacin	0	[0-29.3]	90.5	9.5																
Nalidixic acid	0	[0-29.3]									100									
Colistin	0	[0-29.3]							100											

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 A6.4 Distribution of MICs and resistance (%) in Salmonella Derby from pork (n=22), Denmark

DANMAP 2017

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
Tetracycline	22.7	[5.2-40.2]								77.3					22.7					
Tigecycline	0	[0-28]					81.8	18.2												
Chloramphenicol	9.1	[0-21.1]										90.9		4.5	4.5					
Ampicillin	18.2	[2.1-34.3]							63.6	18.2					18.2					
Cefotaxime	0	[0-28]					100													
Ceftazidime	0	[0-28]						95.5	4.5											
Meropenem	0	[0-28]		100																
Trimethoprim	22.7	[5.2-40.2]					77.3							22.7						
Sulfonamide	22.7	[5.2-40.2]										59.1	13.6	4.5					22.7	
Azithromycin	0	[0-28]									18.2	81.8								
Gentamicin	0	[0-28]						95.5	4.5											
Ciprofloxacin	0	[0-28]	77.3	22.7																
Nalidixic acid	0	[0-28]									100									
Colistin	0	[0-28]							86.4	13.6										

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 Typhimurium from human cases reported as domestically acquired (n=151), associated with travel abroad (n=55) and of unknown origin (n=82), Denmark

DANMAP 2017

Antimicrobial agent	Human cases	% 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
Tetracycline	Domestically acquired	67.5	[60.1-75]								31.1	0.7	0.7		0.7	66.9					
	Travel abroad reported	65.5	[52.9-78]								32.7	1.8				65.5					
	Unknown origin	65.9	[55.6-76.1]								31.7	2.4				65.9					
Tigecycline	Domestically acquired	0.7	[0-2]					47.7	47.7	4.0	0.7										
	Travel abroad reported	11	[2.7-19.1]					34.5	43.6	10.9	10.9										
	Unknown origin	1.2	[0-3.6]					36.6	52.4	9.8	1.2										
Chloramphenicol	Domestically acquired	16.6	[10.6-22.5]										68.9	14.6	0.7		15.9				
	Travel abroad reported	10.9	[2.7-19.1]										70.9	18.2			10.9				
	Unknown origin	6.1	[0.9-11.3]										84.1	9.8			6.1				
Ampicillin	Domestically acquired	72.8	[65.8-79.9]							13.2	13.2	0.7				72.8					
	Travel abroad reported	61.8	[49-74.7]							12.7	25.5					61.8					
	Unknown origin	64.6	[54.3-75]							18.3	17.1					64.6					
Cefotaxime	Domestically acquired	2.0	[0-4.2]					96.0	2.0	0.7		1.3									
	Travel abroad reported	3.6	[0-8.6]					94.5	1.8			3.6									
	Unknown origin	0	[0-7.7]					100.0													
Ceftazidime	Domestically acquired	1.3	[0-3.1]						95.4	2.6	0.7		1.3								
	Travel abroad reported	3.6	[0-8.6]						92.7	3.6		1.8	1.8								
	Unknown origin	0	[0-7.7]						96.3	3.7											
Meropenem	Domestically acquired	0	[0-4.2]		86.1	13.9															
	Travel abroad reported	0	[0-11.5]		89.1	10.9															
	Unknown origin	0	[0-7.7]		87.8	12.2															
Trimethoprim	Domestically acquired	1.3	[0-3.1]					84.8	13.2		0.7				1.3						
	Travel abroad reported	14.5	[5.2-23.9]					74.5	9.1	1.8					14.5						
	Unknown origin	7.3	[1.7-13]					84.1	8.5						7.3						
Sulfonamide	Domestically acquired	73.5	[66.5-80.5]												5.3	15.9	5.3			73.5	
	Travel abroad reported	70.9	[58.9-82.9]												10.9	14.5	3.6			70.9	
	Unknown origin	64.6	[54.3-75]											1.2	13.4	18.3	2.4			64.6	
Azithromycin	Domestically acquired	0	[0-4.2]									45.7	52.3	2.0							
	Travel abroad reported	5.5	[0-11.5]									45.5	49.1		1.8	3.6					
	Unknown origin	0	[0-7.7]									41.5	58.5								
Gentamicin	Domestically acquired	5.3	[1.7-8.9]						81.5	11.9	1.3				5.3						
	Travel abroad reported	5.5	[0-11.5]						76.4	16.4	1.8				5.5						
	Unknown origin	4	[0-7.7]						78.0	18.3					3.7						
Ciprofloxacin	Domestically acquired	2.6	[0.1-5.2]	7.9	87.4	2.0	1.3	0.7	0.7												
	Travel abroad reported	10.9	[2.7-19.1]	14.5	69.1	5.5			7.3	3.6											
	Unknown origin	3.7	[0-7.7]	15.9	76.8	3.7		1.2	2.4												
Nalidixic acid	Domestically acquired	1	[0-2]									62.3	36.4	0.7			0.7				
	Travel abroad reported	3.6	[0-8.6]									60.0	30.9	5.5	1.8		1.8				
	Unknown origin	2.4	[0-5.8]									69.5	26.8	1.2			2.4				
Colistin	Domestically acquired	0.7	[0-2]							96.7	2.6		0.7								
	Travel abroad reported	1.8	[0-5.3]							94.5	3.6	1.8									
	Unknown origin	0	[0-7.7]							97.6	2.4										

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 Campylobacter jejuni from broilers (n=43) and cattle (n=236), Denmark

DANMAP 2017

Antimicrobial agent	Animal spec	% Resistant	95% Confidence interval	Distribution (%) of MICs											
				0.125	0.25	0.5	1	2	4	8	16	32	64	128	>128
Tetracycline	Broilers	16.3	[5,2-27,3]			83.7						4.7	11.6		
	Cattle	6.8	[3,6-10]			92.8	0.4	0.4					6.4		
Erythromycin	Broilers	0	[0-14,6]				100								
	Cattle	0.4	[0-1,3]				97.9	1.7					0.4		
Streptomycin	Broilers	0	[0-14,6]				27.9	60.5	11.6						
	Cattle	0.4	[0-1,3]			0.4	10.6	68.2	20.3	0.4					
Gentamicin	Broilers	0	[0-14,6]			62.8	37.2								
	Cattle	0	[0-2,7]		4.7	50.0	44.5	0.8							
Ciprofloxacin	Broilers	25.6	[12,5-38,6]	51.2	18.6	4.7				2.3	23.3				
	Cattle	30.1	[24,2-35,9]	61.4	7.6	0.8				7.6	22.5				
Nalidixic acid	Broilers	25.6	[12,5-38,6]						55.8	18.6			25.6		
	Cattle	30.1	[24,2-35,9]					4.2	52.1	12.7	0.8		30.1		

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 A6.7 Distribution of MICs and resistance (%) in Campylobacter jejuni from human cases reported as domestically acquired (n=252), associated with travel abroad (n=79) and infections of unknown origin (n=66), Denmark

DANMAP 2017

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
Tetracycline	Domestically acquired	21.8	[16.7-26.9]			76.19	1.98		0.40		2.78	3.57	15.08		
	Travel abroad reported	68.4	[58.1-78.6]			26.58	5.06			1.27	1.27	7.59	58.23		
	Unknown origin	27.3	[16.5-38]			68.18	4.55			1.52		4.55	21.21		
Erythromycin	Domestically acquired	1.2	[0-2.5]				86.90	11.51	0.40					1.19	
	Travel abroad reported	6.3	[01-11.7]				79.75	12.66	1.27				1.27	5.06	
	Unknown origin	0	[0-9.6]				90.91	9.09							
Gentamicin	Domestically acquired	1.2	[0-2.5]	61.11	36.11	1.59			0.40	0.79					
	Travel abroad reported	2.5	[0-6]	67.09	29.11		1.27				2.53				
	Unknown origin	0	[0-9.6]	60.61	34.85	4.55									
Ciprofloxacin	Domestically acquired	37.3	[31.3-43.3]	55.95	6.35	0.40	0.40	0.40	1.59	12.30	22.62				
	Travel abroad reported	92.4	[86.6-98.2]	6.33	1.27				5.06	21.52	65.82				
	Unknown origin	42.4	[30.5-54.3]	48.48	7.58	1.52				12.12	30.30				
Nalidixic acid	Domestically acquired	37.3	[31.3-43.3]					16.67	40.48	5.16	0.40		37.30		
	Travel abroad reported	92.4	[86.6-98.2]					1.27	5.06	1.27			92.41		
	Unknown origin	42.4	[30.5-54.3]					13.64	34.85	9.09			42.42		

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 A7.1 Distribution of MICs and resistance (%) in Enterococcus faecalis from pigs (n=55), Denmark

DANMAP 2017

Antimicrobial agent	% Resistant	95% Confidence interval	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Tetracycline	78.2	[67.3-89.1]						21.8				1.8	5.5	32.7	38.2				
Tigecycline	0	[0-11.5]		9.1	70.9	20.0													
Chloramphenicol	23.6	[12.4-34.9]								14.5	61.8				23.6				
Ampicillin	0	[0-11.5]					16.4	69.1	14.5										
Erythromycin	54.5	[41.4-67.7]						38.2	7.3						54.5				
Gentamicin	7	[0.4-14.1]									36.4	56.4				1.8	3.6	1.8	
Ciprofloxacin	0.0	[0-11.5]				1.8	18.2	76.4	3.6										
Vancomycin	0	[0-11.5]						38.2	56.4	5.5									
Teicoplanin	0	[0-11.5]					100												
Linezolid	0	[0-11.5]						34.5	65.5										
Daptomycin	0	[0-11.5]						36.4	50.9	12.7									

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 A7.2 Distribution of MICs and resistance (%) in indicator Escherichia coli from broilers (n=115), cattle (n=181) and pigs (n=172), Denmark

DANMAP 2017

Antimicrobial agent	Animal species	% 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
Tetracycline	Broilers	13.9	[7.6-20.2]								86.1				0.9	13.0					
	Cattle	7.7	[3.8-11.6]								91.7	0.6				7.7					
	Pigs	37.2	[30-44.4]								61.6	0.6	0.6	0.6	1.7	34.9					
Tigecycline	Broilers	0	[0-5.5]					99.1	0.9												
	Cattle	0	[0-3.5]					99	0.6												
	Pigs	0	[0-3.7]					96.5	3.5												
Chloramphenicol	Broilers	6.1	[1.7-10.5]										93.9		4.3	0.9	0.9				
	Cattle	5.5	[2.2-8.9]										94.5			1.7	3.9				
	Pigs	5.8	[2.3-9.3]										93.6	0.6	1.7	0.6	3.5				
Ampicillin	Broilers	16.5	[9.7-23.3]							1.7	44.3	34.8	2.6			16.5					
	Cattle	6.1	[2.6-9.6]							2.8	28.7	58.6	3.9			6.1					
	Pigs	35.5	[28.3-42.6]							2.9	31.4	28.5	1.7		0.6	34.9					
Cefotaxime	Broilers	0	[0-5.5]					100													
	Cattle	1	[0-1.6]					99.4	0.6												
	Pigs	0	[0-3.7]					100													
Ceftazidime	Broilers	0	[0-5.5]						100												
	Cattle	1	[0-1.6]						99.4	0.6											
	Pigs	0	[0-3.7]						100												
Meropenem	Broilers	0	[0-5.5]		100																
	Cattle	0	[0-3.5]		100																
	Pigs	0	[0-3.7]		100																
Trimethoprim	Broilers	16.5	[9.7-23.3]					83.5							16.5						
	Cattle	2	[0.1-4.4]					95.6	2.2						2.2						
	Pigs	30.2	[23.4-37.1]					68.6	1.2						30.2						
Sulfonamide	Broilers	17.4	[10.5-24.3]										82.6					0.9		16.5	
	Cattle	6.6	[3-10.3]										92.8	0.6						6.6	
	Pigs	34.9	[27.8-42]										64.0	1.2						34.9	
Azithromycin	Broilers	0	[0-5.5]								1.7	34.8	54.8	8.7							
	Cattle	0	[0-3.5]								5.5	46.4	47.0	1.1							
	Pigs	1.2	[0-2.8]								5.2	49.4	41.3	2.9	0.6	0.6					
Gentamicin	Broilers	2.6	[0-5.5]						67.0	28.7	1.7	0.9		1.7							
	Cattle	1	[0-1.6]						79.6	18.8	1.1			0.6							
	Pigs	2.3	[0.1-4.6]						74.4	19.8	3.5	0.6	1.2	0.6							
Ciprofloxacin	Broilers	12.2	[6.2-18.2]	69.6	18.3		0.9	9.6	1.7												
	Cattle	0	[0-3.5]	92.3	7.7																
	Pigs	0.6	[0-1.7]	93.6	5.8			0.6													
Nalidixic acid	Broilers	12.2	[6.2-18.2]									87.8				2.6	9.6				
	Cattle	0	[0-3.5]									100									
	Pigs	0.6	[0-1.7]									98.8	0.6			0.6					
Colistin	Broilers	0	[0-5.5]							100											
	Cattle	0	[0-3.5]							100											
	Pigs	0	[0-3.7]							100											

Vertical solid lines indicate EUCAST epidemiological cut-off values. For E. coli, EUCAST ECOFF are not available for all compounds and complementary cutoff's er set for Azithromycin (MIC > 16). 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 A7.3 Distribution of MICs and resistance (%) in ESBL and AmpC producing Escherichia coli from cattle (n=22) and pigs (n=73), Denmark

DANMAP 2017

Antimicrobial agen	Animal species	% 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	>1024
Tetracycline	Cattle	22.7	[5.2-40.2]								77.3				4.5	18.2					
	Pigs	53.4	[42-64.9]								45.2	1.4			6.8	46.6					
Tigecycline	Cattle	0	[0-28]					100													
	Pigs	0	[0-8.7]					95.9	4.1												
Chloramphenicol	Cattle	4.5	[0-13.2]										95.5				4.5				
	Pigs	11.0	[3.8-18.1]										87.7	1.4	5.5	1.4	4.1				
Ampicillin	Cattle	100	[100-100]												4.5	95.5					
	Pigs	100	[100-100]													100					
Cefoxitin	Cattle	45.5	[24.6-66.3]								36.4	13.6	4.5	9.1	27.3	9.1					
	Pigs	72.6	[62.4-82.8]								1.4	17.8	8.2	15.1	35.6	21.9					
Cefotaxime	Cattle	100	[100-100]						4.5	9.1	27.3	4.5	31.8	4.5	4.5	13.6					
	Pigs	100	[100-100]							5.5	53.4	13.7	2.7	1.4	12.3	11.0					
Ceftazidime	Cattle	68.2	[48.7-87.6]					27.3	4.5	9.1	22.7	36.4									
	Pigs	98.6	[96-100]						1.4	12.3	26.0	32.9	26.0	1.4							
Cefepime	Cattle	54.5	[33.7-75.4]			9.1	36.4	4.5	4.5	27.3			9.1		9.1						
	Pigs	35.6	[24.6-46.6]			11.0	53.4	1.4	6.8	1.4		9.6	11.0	4.1	1.4						
Meropenem	Cattle	0	[0-28]		100																
	Pigs	0	[0-8.7]		100																
Ertapenem	Cattle	0.0	[0-28]	81.8	18.2																
	Pigs	0.0	[0-8.7]	75.3	23.3	1.4															
Imipenem	Cattle	0	[0-28]				45.5	54.5													
	Pigs	0	[0-8.7]				24.7	74.0	1.4												
Trimethoprim	Cattle	9.1	[0-21.1]					90.9							9.1						
	Pigs	37.0	[25.9-48.1]					61.6	1.4						37.0						
Sulfonamide	Cattle	22.7	[5.2-40.2]										77.3							22.7	
	Pigs	52.1	[40.6-63.5]										47.9						1.4	50.7	
Azithromycin	Cattle	0	[0-28]								4.5	22.7	59.1	13.6							
	Pigs	4.1	[0-8.7]								1.4	47.9	43.8	2.7		4.1					
Gentamicin	Cattle	9.1	[0-21.1]						45.5	36.4	9.1				9.1						
	Pigs	1.4	[0-4]						82.2	16.4			1.4								
Ciprofloxacin	Cattle	0	[0-28]	100																	
	Pigs	2.7	[0-6.5]	90.4	6.8				1.4				1.4								
Colistin	Cattle	0	[0-28]							100											
	Pigs	0	[0-8.7]							100											

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 and AmpC producing Escherichia coli from beef (Danish: n=7, Import: n=3) and pork (Danish: n=3, Import: n=4), Denmark

DANMAP 2017

Antimicrobial agent	Food Type	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
Tetracycline	Beef	Danish	42.9	[6.2-79.5]								57.1				14.3	28.6					
		Import	33.3	[0-86.7]								66.7					33.3					
	Pork	Danish	0	[100-100]								66.7	33.3									
		Import	75.0	[32.6-100]								25.0				25.0	50.0					
Tigecycline	Beef	Danish	0	[6.2-79.5]					100													
		Import	0	[100-100]					100													
	Pork	Danish	0	[100-100]					100													
		Import	0	[32.6-100]					100													
Chloramphenicol	Beef	Danish	28.6	[0-62]										71.4				28.6				
		Import	0	[100-100]										100								
	Pork	Danish	0	[100-100]										66.7	33.3							
		Import	25.0	[0-67.4]										75.0				25.0				
Ampicillin	Beef	Danish	100	[100-100]													100					
		Import	100	[100-100]													100					
	Pork	Danish	100	[100-100]													100					
		Import	100	[100-100]													100					
Cefoxitin	Beef	Danish	0	[6.2-79.5]								28.6	42.9	28.6								
		Import	0	[100-100]									100									
	Pork	Danish	0	[100-100]									66.7	33.3								
		Import	25.0	[0-67.4]									75.0			25.0						
Cefotaxime	Beef	Danish	100	[100-100]										14.3	28.6	28.6	28.6					
		Import	100	[100-100]										33.3		33.3	33.3					
	Pork	Danish	100	[100-100]												66.7	33.3					
		Import	100	[100-100]								25.0				25.0	50.0					
Ceftazidime	Beef	Danish	57	[20.5-93.8]					14.3	28.6	14.3	28.6		14.3								
		Import	100	[100-100]								66.7		33.3								
	Pork	Danish	100	[100-100]							66.7		33.3									
		Import	100	[100-100]							50.0	25.0	25.0									
Cefepime	Beef	Danish	100	[100-100]							28.6	14.3	14.3	14.3		28.6						
		Import	100	[100-100]								33.3	33.3		33.3							
	Pork	Danish	100	[100-100]										66.7	33.3							
		Import	75.0	[32.6-100]				25.0						50.0	25.0							
Meropenem	Beef	Danish	0	[6.2-79.5]		100																
		Import	0	[100-100]		100																
	Pork	Danish	0	[100-100]		100																
		Import	0	[32.6-100]		100																
Ertapenem	Beef	Danish	0	[6.2-79.5]	85.7		14.3															
		Import	0	[100-100]	100																	
	Pork	Danish	0	[100-100]	100																	
		Import	0	[32.6-100]	100																	
Imipenem	Beef	Danish	0	[6.2-79.5]				85.7	14.3													
		Import	0	[100-100]				33.3	66.7													
	Pork	Danish	0	[100-100]				66.7	33.3													
		Import	0	[32.6-100]				25.0	50.0	25.0												
Trimethoprim	Beef	Danish	28.6	[0-62]					71.4							28.6						
		Import	66.7	[13.3-100]					33.3							66.7						
	Pork	Danish	100	[100-100]												100						
		Import	25.0	[0-67.4]					75.0							25.0						
Sulfonamide	Beef	Danish	42.9	[6.2-79.5]										57.1							42.9	
		Import	66.7	[13.3-100]										33.3							66.7	
	Pork	Danish	100	[100-100]																	100	
		Import	50.0	[1-99]										50.0							50.0	
Azithromycin	Beef	Danish	0	[6.2-79.5]									42.9	42.9	14.3							
		Import	0	[100-100]								33.3	33.3	33.3								
	Pork	Danish	33	[0-86.7]									66.7				33.3					
		Import	0	[32.6-100]									75.0	25.0								
Gentamicin	Beef	Danish	28.6	[0-62]						42.9	28.6				28.6							
		Import	0	[100-100]						100												
	Pork	Danish	0	[100-100]						100												
		Import	25.0	[0-67.4]						50.0	25.0					25.0						
Ciprofloxacin	Beef	Danish	28.6	[0-62]	71.4			14.3		14.3												
		Import	0	[100-100]	100																	
	Pork	Danish	0	[100-100]	100																	
		Import	25.0	[0-67.4]	75.0									25.0								
Nalidixic acid	Beef	Danish	0	[6.2-79.5]									85.7		14.3							
		Import	0	[100-100]									100									
	Pork	Danish	0	[100-100]									100									
		Import	25.0	[0-67.4]									75.0					25.0				
Colistin	Beef	Danish	0	[6.2-79.5]							100											
		Import	0	[100-100]							100											
	Pork	Danish	0	[100-100]							100											
		Import	0	[32.6-100]							100											

Vertical solid lines indicate EUCAST epidemiological cut-off values. For E. coli, EUCAST ECOFF are not available for all compounds and complementary cutoff's er 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

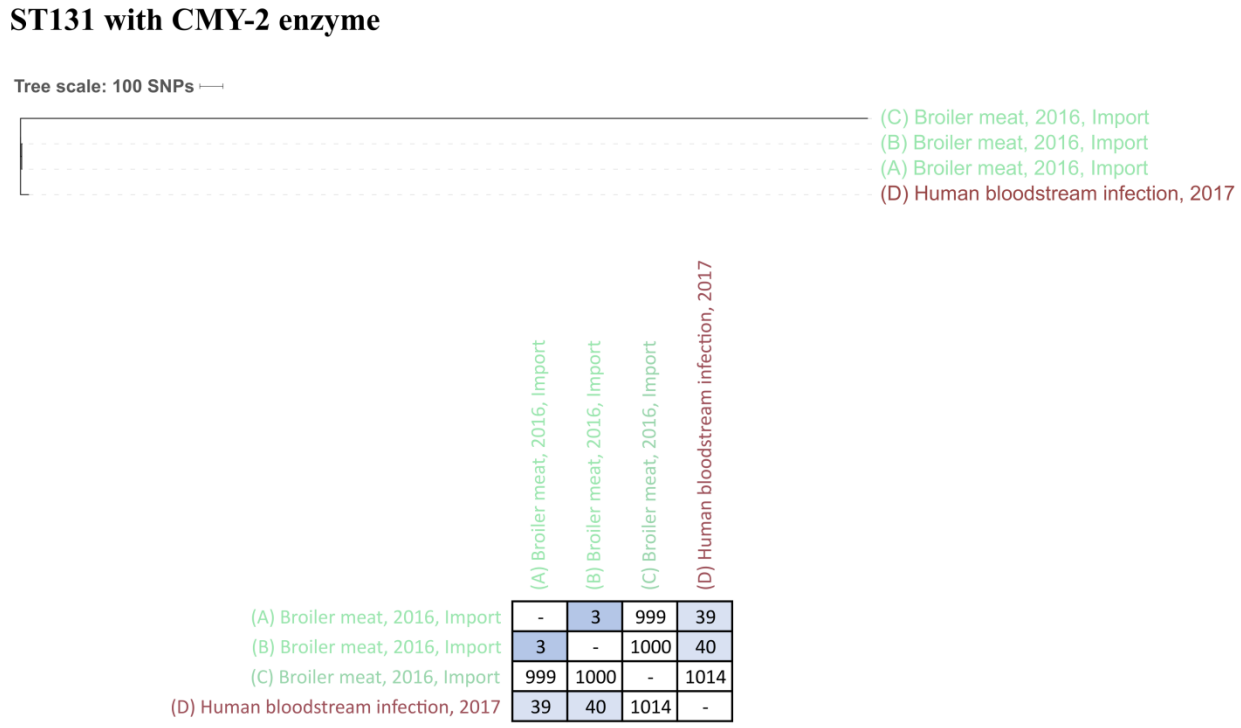
Confidence intervals are calculated as 95% binomial proportions presenting Wilson intervals

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

Figure A7.5. SNP Phylogeny of ST131 CMY-2 producing *Escherichia coli* from DANMAP 2016-2017: One isolate from human bloodstream and three isolates from imported broiler meat, Denmark

	(A) Broiler meat, 2016, Import	(B) Broiler meat, 2016, Import	(C) Broiler meat, 2016, Import	(D) Human bloodstream infection, 2017
(A) Broiler meat, 2016, Import	-	3	999	39
(B) Broiler meat, 2016, Import	3	-	1000	40
(C) Broiler meat, 2016, Import	999	1000	-	1014
(D) Human bloodstream infection, 2017	39	40	1014	-

Figure A7.5. SNP Phylogeny of ST131 CMY-2 producing *Escherichia coli* from DANMAP 2016-2017: One isolate from human bloodstream and three isolates from imported broiler meat, Denmark



	(A) Broiler meat, 2016, Import	(B) Broiler meat, 2016, Import	(C) Broiler meat, 2016, Import	(D) Human bloodstream infection, 2017
(A) Broiler meat, 2016, Import	-	3	999	39
(B) Broiler meat, 2016, Import	3	-	1000	40
(C) Broiler meat, 2016, Import	999	1000	-	1014
(D) Human bloodstream infection, 2017	39	40	1014	-