

Annex E – Data reported on antimicrobial resistance in MRSA from food-producing animals and derived meat

Annex to:

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Table 1a: Methicillin-resistant *Staphylococcus aureus* in food, 2021

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	Positive for MRSA (%)
Meat from bovine animals				
Austria	Fresh - Retail Monitoring	Batch	326	15 (4.6%) ^(a)
Germany	Fresh - Sampling at border control post (monitoring)	Single	73	8 (11%) ^(b)
	Fresh (chilled) - Retail Monitoring	Single	405	15 (3.7%) ^(c)
Netherlands	Fresh - Retail Monitoring	Single	261	18 (6.9%)*
Meat from broilers (<i>Gallus gallus</i>)				
Netherlands	Fresh (chilled) – Retail Monitoring	Single	310	25 (8.1%)*
Meat from pigs				
Austria	Fresh - Retail Monitoring	Batch	319	68 (21.3%) ^(d)
Finland	Fresh (chilled) - Retail Survey	Batch	206	26 (12.6%) ^(e)
Germany	Fresh - Sampling at border control post (monitoring)	Single	7	1 (14.3%) ^(f)
Meat from turkey				
Netherlands	Fresh (chilled) – Retail Monitoring	Single	14	3 (21.4%)*
Meat from deer (venison)				
Netherlands	Fresh - Sampling at border control post (monitoring)	Batch	15	0 (0.0%)
Meat from duck				
Netherlands	Fresh - Sampling at border control post (monitoring)	Batch	1	1 (100.0%)*
Meat from sheep				
Netherlands	Fresh - Retail Monitoring	Single	255	30 (11.8%)*
	Retail Monitoring	Single	44	7 (15.9%)*

(a) *Spa*-types: t95 ST45 (7), t011 ST398 (4), t034 ST398 (1), t898 ST399 (1), t588 ST402 (1), t034 ST4561 (1)(b) *Spa*-types: t1346 ST72 (1), t002 (2), t008 (2), t311 (2), t2112 (1)(c) *Spa*-types: t174 ST41110 (1), t011 (4), t034 (4), t359 (1), t559 (1), t843 *mecC* positive (1), t899 (1), t1430 (1), t1451 (1)(d) *Spa*-types: t899 ST9 (5), t1430 ST9 (2), t095 ST45 (11), t011 ST398 (22), t034 ST398 (12), t1793 ST398 (1), t2576 ST398 (1), t9013 ST398 (1), t588 ST400 (1), t011 (2), t571 (1)(e) *Spa*-types: t728 ST45 (1), t034 ST398 (14), t899 ST398 (1), t2741 ST398 (9), t4677 ST398 (1)(f) *Spa*-types: t1430* *Spa*-types not provided

Table 1b: Methicillin-resistant *Staphylococcus aureus* in food, 2020

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	Positive for MRSA (%)
Meat from bovine animals				
Netherlands	Fresh – Retail Monitoring	Single	52	2 (3.8%)*
Meat from broilers (<i>Gallus gallus</i>)				
Netherlands	Fresh (chilled) – Retail Monitoring	Single	234	36 (15.4%)*
Austria	Fresh – Retail Monitoring	Batch	306	8 (2.6%)(a)
Meat from pigs				
Netherlands	Fresh – Retail Monitoring	Single	57	2 (3.5%)*
Slovakia	Fresh – Retail surveillance	Batch	63	13 (20.6%)*
Meat from turkey				
Netherlands	Fresh (chilled) – Retail Monitoring	Single	14	5 (35.7%)*
Meat from Sheep				
Germany	Fresh (chilled/frozen) – Retail Monitoring	Single	386	11 (2.8%)(b)
Meat from other animals or unspecified				
Netherlands	Sampling at border control post (monitoring)	batch	3	0
Meat from deer				
Netherlands	Sampling at border control post (monitoring)	batch	1	0
Soft and semi-soft cheese				
Germany	Made from raw or low heat-treated milk – retail monitoring	single	345	0

(a) *Spa*-types: t011 (4 isolates), t034 (4)

(b) *Spa*-types: t011 (1), t034 (2), t1451 (1), t2576 (1), t19979 ST 398 (1), t223 (2), t267 (1), t1154 ST5 (1) t15010 ST97 (1)

* *Spa*-types not provided

Table 2a: Methicillin-resistant *Staphylococcus aureus* in food-producing animals, clinical investigations excluded, 2021

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	Positive for MRSA (%)
Cattle (bovine animals)				
Belgium	Calves (under 1 year) - veal calves - Farm Monitoring	Herd/Flock	145	79 (54.5%) ^(a)
	Dairy cows - Farm Monitoring	Herd/Flock	128	15 (11.7%) ^(b)
	Meat production animals - Farm Monitoring	Herd/Flock	85	4 (4.7%) ^(c)
Netherlands	Dairy cows - adult - Farm Surveillance	Herd/Flock	362	18 (5.0%)*
Switzerland	Calves (under 1 year) - Slaughterhouse Monitoring	Animal	294	18 (6.1%) ^(d)
Pigs				
Norway	Farm control and eradication programmes	Herd/Flock	763	0 (0.0%)
Switzerland	Fattening pigs - slaughterhouse monitoring	Animal	289	155 (53.6%) ^(d)

(a) *Spa*-types: t386 ST1 CC1 (1); t011 (65), t034 (6), t1451 (1), t1456 (1), t2346 (1), t2370 (1), t3423 (1), t5210 (1), and t6228 (1) all belonging to CC 398.

(b) *Spa*-types: t037 ST239 CC8 (3); t011 (10) and t034 (2) belonging to CC398.

(c) *Spa*-types: t037 ST239 CC8 (2), t011 CC398 (2)

(d) was not *spa* typed but belonged to CC398

* *Spa*-types not provided

Table 2b: Methicillin-resistant *Staphylococcus aureus* in food-producing animals, clinical investigations excluded, 2020

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	Positive for MRSA (%)
Gallus gallus (fowl)				
Belgium	Broilers, nasal swabs – OFM	Herd/flock	60	2 (3.3%) ^(a)
Belgium	Layers, nasals swabs – OFM	Herd/flock	28	0
Turkeys				
Belgium	Fattening flocks, nasal swabs – OFM	Herd/flock	18	2 (11.1%) ^(b)
Pigs				
Netherlands	Fattening pigs, dust swabs – Farm Surveillance	Herd/flock	62	49 (79.0%)*
Slovakia ^(c)	Fattening pigs, caeca, abattoir	Animal	89	16 (18.0%)*
Norway	OFCEP, pooled skin swabs & pooled environmental swabs	Herd/flock	641	0 ^(g)
Wild boar				
Germany	Nasal swabs – hunted wild boars	Animal	262	2 (0.8%)*
Wild fish				
Germany	Organ/tissue	Animal	103	1 (1.0%)*

(a) *Spa*-types: t011 (2 isolates)

(b) *Spa*-types: t011 (2 isolates)

(c) data were reported as suspect sampling

* *Spa*-types not reported

Table 3: Methicillin-resistant *Staphylococcus aureus* in food-producing animals, clinical investigations, 2020

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	(%) positive for MRSA
Cattle (bovine animals)				
Slovakia	Dairy cows – OFCI	Animal	5	0
Goats				
Slovakia	Production type unspecified – OFCI	Animal	2	0

OFCI: On-farm clinical investigations.

Table 4a: Methicillin-resistant *Staphylococcus aureus* in non-food-producing animals, clinical investigations, 2020

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	(%) positive for MRSA
Cats				
Netherlands	VCCI	Animal	1569	12 (0.8%)*
Slovakia	VCCI	Animal	9	0
Dogs				
Netherlands	VCCI	Animal	1363	6 (0.4%)*
Slovakia	VCCI	Animal	23	0
Horses				
Netherlands	OFCI	Animal	772	42 (5.4%)*
Slovakia	VCCI	Animal	2	0
Other pets				
Netherlands	VCCI, pet birds, unspecified	Animal	1	1 (100%)*
Slovakia	VCCI, Rabbits	Animal	1	0
Slovakia	VCCI, Guinea pigs	Animal	1	0
Wild animals				
Slovakia	VCCI, Falcons	Animal	1	0
Slovakia	VCCI, Squirrels	Animal	1	0

VCCI: At-veterinary-clinic clinical investigations; OFCI: On-farm clinical investigations.

* *spa*-types not reported.

Table 4b: Methicillin-resistant *Staphylococcus aureus* in companion animals, clinical investigations, 2021

Country	Production type/monitoring description (where specified)	Sample unit	Number	
			Units tested	(%) positive for MRSA
Cats				
Netherlands	VCCI	Animal	723	6 (0.8%)*
Dogs				
Netherlands	VCCI	Animal	4121	6 (0.1%)*
Horses				
Netherlands	OFCI	Animal	530	10 (1.9%)*

VCCI: At-veterinary-clinic clinical investigations; OFCI: On-farm clinical investigations.

* *spa*-types not reported.

Table 5: Temporal trends in prevalence of methicillin-resistant *Staphylococcus aureus* in various types of meat (at retail monitoring), four reporting countries, 2011-2021

Country	Year	Production type / description	Sample unit	Isolation method	Number	
					Units tested	Positive for MRSA (%)
Meat from broilers (<i>Gallus gallus</i>)						
Austria	2018	Fresh – ARM	Single	1-S	298	3 (1,0 %)
	2020	Fresh – ARM	batch	1-S	306	8 (2,6 %)
Germany	2011	Fresh – ARM	Single	2-S	404	107 (26.5%)
	2013	Fresh – ARM	Single	2-S	443	107 (24.2%)
	2016	Fresh – ARM (active)	Single	2-S	422	55 (13.0%)
	2018	Fresh (skinned) – ARM (active)	Single	2-S	444	73 (16.4%)
Netherlands	2018	Fresh (chilled) – ARM	Single	1-S	129	26 (20.2%)
	2019	Fresh (chilled) – ARM	Single	1-S	237	41 (17.3%)
	2020	Fresh (chilled) – ARM	Single	1-S	234	36 (15.4 %)
	2021	Fresh (chilled) - ARM	Single	1-S	310	25 (8.1%)
Switzerland	2016	Fresh – ARM	Single	2-S	302	9 (3.0%)
	2018	Fresh – ARM	Single	2-S	312	4 (1.3%)
Meat from turkeys						
Germany	2012	Fresh – ARM	Single	2-S	749	282 (37.7%)
	2014	Fresh – ARM (active)	Single	2-S	339	144 (42.5%)
	2016	Fresh – ARM (active)	Single	2-S	458	204 (44.5%)
	2018	Fresh (skinned) – ARM (active)	Single	2-S	525	224 (42.7%)
Netherlands	2018	Fresh (chilled) – ARM	Single	1-S	3	3 (100%)
	2019	Fresh (chilled) – ARM	Single	1-S	14	9 (64.3%)
	2020	Fresh (chilled) – ARM	Single	1-S	14	5 (35.7%)
	2021	Fresh (chilled) - ARM	Single	1-S	14	3 (21.4%)
Meat from bovine animals						
Netherlands	2018	Fresh – ARM	Single	1-S	140	3 (2.1%)
	2019	Fresh – ARM	Single	1-S	286	11 (3.8%)
	2020	Fresh – ARM	Single	1-S	52	2 (3.8 %)
	2021	Fresh – ARM	Single	1-S	261	18 (6.9%)
Switzerland	2017	Fresh (chilled) – ARM	Single	2-S	299	0
	2019	Fresh (chilled) – ARM	Single	1-S	309	2 (0.6%)
Germany	2021	Fresh - BCPM	Single	Other	73	8 (11%)
	2021	Fresh (chilled) - ARM	Single	Other	405	15 (3.7%)
Austria	2019	Fresh - ARM	Batch	1-S	228	6 (2.6%)
	2021	Fresh - ARM	Batch	1-S	326	15 (4.6%)
Meat from pigs						
Netherlands	2018	Fresh – ARM	Single	1-S	135	8 (5.9%)
	2019	Fresh – ARM	Single	1-S	296	25 (8.4%)
	2020	Fresh – ARM	Single	1-S	57	2 (3.5 %)
Switzerland	2017	Fresh (chilled) – ARM	Single	2-S	301	2 (0.7%)
	2019	Fresh (chilled) – ARM	Single	1-S	311	1 (0.3%)
Austria	2019	Fresh - ARM	Batch	1-S	318	50 (15.7%)

2021	Fresh - ARM	Batch	1-S	319	68 (21.3%)
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ARM: Retail Monitoring; BCPM: Border Control Posts Monitoring; CM: Catering Monitoring; CPM: Cutting Plant Monitoring; GHES: Game Handling Establishment Surveillance; MCFM: Medical Care Facility Monitoring; NFCEP: National Farm Control and Eradication Programme; PPM: Processing Plant Monitoring; RS: Retail Survey; SHM: slaughterhouse monitoring; UM: Unspecified Monitoring. Method of isolation: 1-S (1 step method); 2-S (2 step method); other (Other MRSA isolation method).

Table 6: Temporal trends in prevalence of methicillin-resistant *Staphylococcus aureus* in various food-producing animals, six reporting countries, 2012-2021

Country	Year	Production type/description	Sample unit	Isolation method	Number	
					Units tested	Positive for MRSA (%)
Broilers						
Belgium	2014	During rearing period OFS, NS, convenience sampling	Herd/flock	2-S	79	2 (2.5 %)
	2017	During rearing period OFS, NS, convenience sampling	Herd/flock	2-S	80	2 (2.5 %)
	2020	During rearing period OFM, NS, objective sampling	Herd/flock	2-S	60	2 (3.3 %)
Laying hens						
Belgium	2014	Adult OFS, NS, convenience sampling	Herd/flock	2-S	246	6 (2.4%)
	2017	Adult OFS, NS, convenience sampling	Herd/flock	2-S	236	3 (1.3 %)
	2020	Adult OFM, NS, objective sampling	Herd/flock	2-S	28	0
Turkeys						
Germany	2012	Meat production animals, DS – OFM	Flock	2-S	235	30 (12.8%)
	2014	Meat production animals, DS – OFM (active)	Flock	2-S	192	42 (21.9%)
	2018	Fattening turkeys (before slaughter), DS – OFM (active)	Flock	2-S	297	51 (17.2%)
Cattle (bovine animals)						
Belgium	2012	Veal calves (under 1 year), NS – OFM	Herd	2-S	104	49 (47.1%)
	2015	Veal calves (under 1 year), NS – OFM (active)	Herd	2-S	147	116 (78.9%)
	2018	Veal calves (under 1 year), NS – OFM (active)	Herd	2-S	145	79 (54.5%)
	2021	Veal calves (under 1 year), NS – OFM (active)	Herd	2-S	145	79 (54.5%)
	2012	Dairy cows, NS – OFM (active)	Herd	2-S	141	14 (9.9%)
	2015	Dairy cows, NS – OFM (active)	Herd	2-S	96	10 (10.4%)
	2018	Dairy cows, NS – OFM (active)	Herd	2-S	93	13 (14.0%)
	2021	Dairy cows, NS – OFM (active)	Herd	2-S	128	15 (11.7%)
	2012	Meat production animals, NS – OFM	Herd	2-S	187	19 (10.2%)

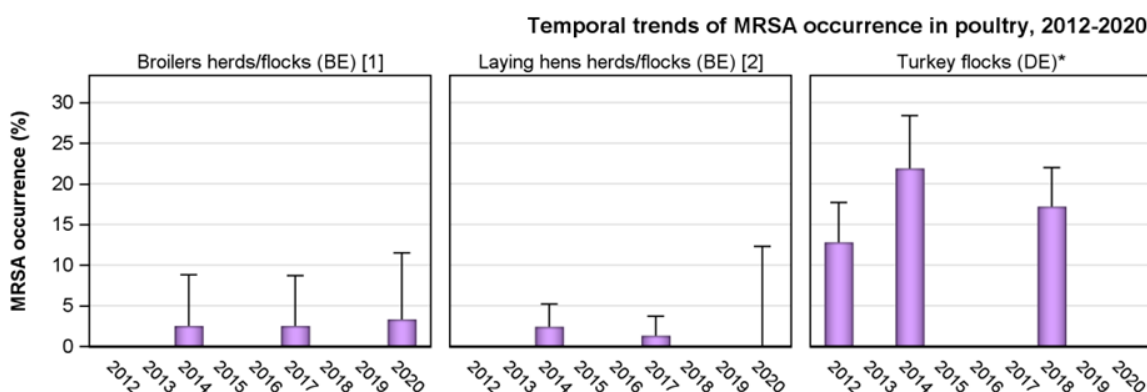
	2015	Meat production animals, NS – OFM (active)	Herd	2-S	104	16 (15.4%)
	2018	Meat production animals, NS – OFM (active)	Herd	2-S	103	9 (8.7%)
	2021	Meat production animals, NS – OFM (active)	Herd	2-S	85	4 (4.7%)
Denmark	2018	Dairy cows, NS – FS (National Survey)	Herd	1-S	132	8 (6.1%)
	2019	Dairy cows, NS – FS (National Survey)	Herd	1-S	131	2 (1.5%)
Switzerland	2015	Calves (<1 year), NS – SHM	Animal	2-S	292	19 (6.5%)
	2017	Calves (<1 year), NS – SHM	Animal	2-S	297	24 (8.1%)
	2019	Calves (<1 year), NS – SHM	Animal	1-S	299	11 (3.7%)
	2021	Calves (<1 year), NS – SHM	Animal	1-S	294	18 (6.1%)

Pigs

Belgium	2016	Breeding animals; NS – OFM	Herd	2-S	153	91 (59.5%)
	2019	Breeding animals; NS – OFM	Herd	2-S	179	83 (46%)
	2016	Fattening pigs, NS – OFM	Herd	2-S	177	112 (63.3%)
	2019	Fattening pigs, NS – OFM	Herd	2-S	180	105 (58.3%)
Denmark	2016	Breeding animals, NS – OFM (National Survey)	Herd	2-S	6	6 (100%)
	2018	Breeding animals, NS – OFM (National Survey)	Herd	1-S	41	34 (82.9%)
	2019	Breeding animals (multiplier herds), NS – OFM (National Survey)	Herd	1-S	73	69 (94.5%)
	2016	Fattening pigs (conventional herds), NS – OFM (National Survey)	Herd	2-S	57	50 (87.7%)
	2018	Fattening pigs (raised under CHC), NS – OFM (National Survey)	Herd	1-S	130	116 (89.2%)
Germany	2017	Fattening pigs, BS – OFM (active)	Herd	2-S	341	130 (38.1%)
	2019	Fattening pigs, BS – OFM (active)	Herd	2-S	389	139 (35.7%)
Netherlands	2020	Fattening pigs, DS-OFM	Herd		62	49 (79%)
Norway	2014	Pigs, PSS & PES – NFCEP	Herd	2-S	986	1 (0.1%)
	2015	Pigs, PSS & PES – NFCEP	Herd	2-S	821	4 (0.5%)
	2016	Pigs, PSS & PES – NFCEP	Herd	2-S	872	1 (0.1%)
	2017	Pigs, PSS & PES – NFCEP	Herd	2-S	826	3 (0.4%)
	2018	Pigs, PSS & PES – NFCEP	Herd	1-S	716	0
	2019	Pigs, PSS & PES – NFCEP	Herd	1-S	722	1 (0.1%)
	2020	Pigs, PSS & PES – NFCEP	herd	1-S	641	0
	2021	Pigs, PSS & PES – NFCEP	herd	1-S	736	0
Switzerland	2010	Fattening pigs, NS – SHM	Animal	2-S	392	23 (5.9%)
	2011	Fattening pigs, NS – SHM	Animal	2-S	392	22 (5.6%)

2012	Fattening pigs, NS – SHM	Animal	2-S	397	72 (18.1%)
2013	Fattening pigs, NS – SHM	Animal	2-S	351	73 (20.8%)
2014	Fattening pigs, NS – SHM	Animal	2-S	298	79 (26.5%)
2015	Fattening pigs, NS – SHM	Animal	2-S	300	77 (25.7%)
2017	Fattening pigs, NS – SHM	Animal	2-S	298	131 (44.0%)
2019	Fattening pigs, NS – SHM	Animal	1-S	303	160 (52.8%)
2021	Fattening pigs, NS – SHM	Animal	1-S	289	155 (53.6%)

OFM: on-farm monitoring; OFS: on-farm surveillance; NFCEP: National Farm Control and Eradication Programme; FS: Farm survey; CHC: controlled housing conditions; SHM: slaughterhouse monitoring; BTM: bulk tank milk; BS: boot swabs; NS: nasal swabs, PSS: pooled skin swabs; PES: pooled environmental swabs; DS: dust samples. Method of isolation: 1-S (1 step method); 2-S (2 step method).



BE: Belgium; DE: Germany.

Broilers (BE) : Broiler flocks in 2014: *spa*-types t011 CC398 (1 isolate), t1985 CC398 (1)

Broiler flocks in 2017 and 2020: *spa*-type t011 (2 isolates each)

Laying hens (BE) : Laying hens in 2014: *spa*-types t011 CC398 (1 isolate), t037 (5)

Laying hens in 2017: *spa*-types t011 (2 isolates), t037 ST239 (1)

Figure 1: Temporal trends of MRSA prevalence in poultry, 2012-2020

Table 7a: Occurrence of resistance (%) to selected antimicrobials in MRSA from food and animals, 2021

Country	N	GEN	KAN	STR	CHL	RIF	CIP	ERY	CLI	Q/D	LZD	TIA	MUP	FUS	SMX	TMP	TET	VAN
Cattle (bovine animals) - calves (under 1 year)																		
Switzerland	18	11.1	11.1	50.0	27.8	0.0	55.6	55.6	61.1	27.8	0.0	11.1	0.0	0.0	0.0	16.7	100.0	0.0
Belgium	79 ^(a)	67.1	70.9	13.9	13.9	0.0	27.8	93.7	93.7	15.2	0.0	10.1	0.0	0.0	7.6	96.2	100.0	0.0
Cattle (bovine animals) - dairy cows																		
Belgium	15 ^(b)	33.3	60.0	26.7	20.0	20.0	20.0	60.0	46.7	33.3	0.0	26.7	0.0	0.0	20.0	66.7	100.0	0.0
Cattle (bovine animals) - meat production animals																		
Belgium	4 ^(c)	50.0	100.0	50.0	50.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	0.0
Pigs - fattening pigs																		
Switzerland	155	10.3	10.3	25.2	12.3	0.0	31.6	29.7	43.2	42.6	0.0	43.2	0.0	0.0	0.0	47.7	98.1	0.0
Meat from bovine animals - fresh or chilled																		
Germany	23 ^(d)	8.7	17.4	8.7	0.0	0.0	34.8	30.4	17.4	4.3	0.0	17.4	0.0	0.0	0.0	21.7	43.5	0.0
Meat from pig - fresh or frozen																		
Germany	1 ^(e)	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N: Number of isolates tested; GEN: gentamicin; KAN: kanamycin; STR: streptomycin; CHL: chloramphenicol; RIF: rifampicin; CIP: ciprofloxacin; ERY: erythromycin; CLI: clindamycin; Q/D: quinupristin/dalfopristin; LZD: linezolid; TIA: tiamulin; MUP: mupirocin; FUS: fusidic acid; SMX: sulfamethoxazole; TMP: trimethoprim; TET: tetracycline.

All MRSA isolates were resistant to penicillin and ceftiofur, as expected.

(a) *Spa*-types: t386 ST1 (1), t011 (65), t034 (6), t1451 (1), t1456 (1), t2346 (1), t2370 (1), t3423 (1), t5210 (1), t6228 (1)

(b) *Spa*-types: t037 ST239 (2), t011 (10), t034 (2)

(c) *Spa*-types: t037 ST239 (2), t011 (2)

(d) *Spa*-types: t1346 (1), t002 (2), t008 (2), t311 (2), t2112 (1), t174 ST41110 (1), t011 (4), t034 (4), t359 (1), t559 (1) t843 mecC positive (1), t899 (1), t1430 (1), t1451 (1)

(e) *Spa*-types: t1430 (1)

Table 7b: Occurrence of resistance (%) to selected antimicrobials in MRSA from food and animals, 2020

Country	N	GEN	KAN	STR	CHL	RIF	CIP	ERY	CLI	Q/D	LZD	TIA	MUP	FUS	SMX	TMP	TET	VAN
Meat from broilers – fresh																		
Austria	8 ^(a)	0	0	0	0	12,5	12,5	62,5	62,5	50,0	0	50,0	0	0	0	50,0	100	0
Meat from sheep – fresh or frozen																		
Germany	11 ^(c)	0	9.1	9.1	9.1	0	0	45.5	18.2	9.1	0	9.1	0	0	0	27.3	54.5	9.1
Gallus gallus broiler flocks																		
Belgium	2 ^(c)	0	0	0	0	0	0	50,0	50,0	0	0	0	0	0	0	50,0	100	0
Turkey – fattening flocks																		
Belgium	2 ^(d)	0	0	0	0	0	100	50,0	50,0	0	0	0	0	0	0	100	100	0

N: Number of isolates tested; GEN: gentamicin; KAN: kanamycin; STR: streptomycin; CHL: chloramphenicol; RIF: rifampicin; CIP: ciprofloxacin; ERY: erythromycin; CLI: clindamycin; Q/D: quinupristin/dalfopristin; LZD: linezolid; TIA: tiamulin; MUP: mupirocin; FUS: fusidic acid; SMX: sulfamethoxazole; TMP: trimethoprim; TET: tetracycline. All MRSA isolates were resistant to penicillin and ceftioxin.

(a) *Spa*-types: t011 (4 isolates), t034 (4)

(b) *Spa*-types: t011 (2), t034 (1), t1451 (1), t2576 (1), t19979 ST 398 (1), t223 (2), t267 (1), t1154, ST5 (1) t15010 ST97 (1)

(c) *Spa*-types: t011 CC398 (2 isolates)

(d) *Spa*-types: t011 CC398 (2 isolates)

Table 8a: Frequently occurring MDR-patterns in MRSA-isolates from animals and food 2021.

MDR-patterns in MRSA-isolates	Calves (CH, n=18)	Pigs (CH, n=155)	Pig meat (DE, n=1)	Cow meat (DE, n=23)	Calves (BE, n=79)	Dairy cows (BE, n=15)	Cow meats (BE, n=4)	Tot
CHL-PNC-FOX-CIP	0	0	1	0	0	0	0	1
CHL-PNC-FOX-CIP-TET	3	16	0	0	0	0	0	19
CHL-PNC-FOX-CIP-ERY-CLI-TET	0	1	0	0	0	0	0	1
CHL-PNC-FOX-CIP-ERY-CLI-Q/D-TIA-TMP-TET	0	0	0	0	1	0	0	1
CHL-PNC-FOX-ERY-CLI-Q/D-TIA-TMP-TET	0	0	0	0	1	0	0	1
CHL-PNC-FOX-ERY-CLI-TET	0	0	0	0	1	0	0	1
CHL-PNC-FOX-CIP-ERY-CLI-TMP-TET	1	0	0	0	0	0	0	1
GEN-CHL-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
GEN-KAN-CHL-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
GEN-KAN-PNC-FOX	0	0	0	2	0	0	0	2
GEN-KAN-PNC-FOX-CIP-ERY-CLI-TMP-TET	0	0	0	0	7	0	0	7
GEN-KAN-PNC-FOX-ERY-CLI-Q/D-TMP-TET	0	0	0	0	4	1	0	5
GEN-KAN-PNC-FOX-ERY-CLI-Q/D-SMX-TMP-TET	0	0	0	0	1	0	0	1
GEN-KAN-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	28	2	0	30
GEN-KAN-PNC-FOX-ERY-CLI-SMX-TMP-TET	0	0	0	0	3	0	0	3
GEN-KAN-PNC-FOX-CIP-TMP-TET	0	2	0	0	0	1	0	3

GEN-KAN-PNC-FOX-CLI-TIA-TMP-TET	0	1	0	0	0	0	0	1
GEN-KAN-PNC-FOX-TET	2	11	0	0	0	0	0	13
GEN-KAN-PNC-FOX-TMP-TET	0	1	0	0	3	1	2	7
GEN-KAN-STR-CHL-PNC-FOX-CIP-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
GEN-KAN-STR-CHL-PNC-FOX-CIP-ERY-CLI-Q/D-TIA-TET	0	1	0	0	0	0	0	1
GEN-KAN-STR-PNC-FOX-CIP-ERY-CLI-TMP-TET	0	0	0	0	2	0	0	2
GEN-KAN-STR-PNC-FOX-ERY-CLI-SMX-TMP-TET	0	0	0	0	1	0	0	1
GEN-KAN-STR-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
KAN-CHL-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
KAN-PNC-FOX-ERY-CLI-Q/D-TIA-TET	0	0	0	0	0	1	0	1
KAN-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
KAN-STR-CHL-PNC-FOX-CIP-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
KAN-STR-CHL-PNC-FOX-RIF ERY-SMX-TET	0	0	0	0	0	3	2	5
KAN-STR-CHL-PNC-FOX-ERY-CLI-TET	0	0	0	0	1	0	0	1
KAN-STR-PNC-FOX-ERY-TET	0	0	0	2	0	0	0	2
PNC-FOX-CIP	0	0	0	4	0	0	0	4
PNC-FOX-CIP-ERY-CLI-TMP TET	0	0	0	1	5	0	0	6
PNC-FOX-CIP-ERY-CLI-TIA-TMP-TET	0	0	0	1	0	0	0	1
PNC-FOX-CIP-ERY-CLI-Q/D-TET	2	0	0	0	0	0	0	2

Annex E: EUSR AMR in zoonotic and indicator bacteria from humans, animals, and food 2020-2021

PNC-FOX-CIP-ERY-CLI-Q/D-TIA-TMP-TET	0	1	0	1	1	0	0	3
PNC-FOX-CIP-TIA-TET	0	0	0	1	0	0	0	1
PNC-FOX-CIP-TMP-TET	0	0	0	0	1	2	0	3
PNC-FOX-CIP-TET	0	18	0	0	0	0	0	18
PNC-FOX-CLI-Q/D-TIA-TMP	0	3	0	0	0	0	0	3
PNC-FOX-CLI-Q/D-TIA-TMP TET	0	16	0	0	0	1	0	17
PNC-FOX-ERY	0	0	0	1	0	0	0	1
PNC-FOX-ERY-CLI-TIA-TMP-TET	0	0	0	1	0	0	0	1
PNC-FOX-ERY-CLI-Q/D-TIA-TET	0	0	0	0	1	0	0	1
PNC-FOX-ERY-CLI-Q/D-TIA TMP-TET	0	27	0	0	1	1	0	29
PNC-FOX-ERY-CLI-SMX-TMP-TET	0	0	0	0	1	0	0	1
PNC-FOX-ERY-Q/D-TMP-TET	0	1	0	0	0	0	0	1
PNC-FOX-ERY-TIA-TMP-TET	0	1	0	0	0	0	0	1
PNC-FOX-ERY-TMP-TET	0	3	0	0	0	0	0	3
PNC-FOX-TIA-TMP-TET	0	0	0	0	1	0	0	1
PNC-FOX-TMP-TET	0	1	0	1	0	0	0	2
PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	4	0	0	4
PNC-FOX-TET	1	13	0	2	0	1	0	17
STR-CHL-PNC-FOX-CIP-TET	0	1	0	0	0	0	0	1
STR-PNC-FOX-CIP-CLI-Q/D TIA-TMP-TET	1	4	0	0	0	0	0	5
STR-PNC-FOX-CIP-ERY-CLI-Q/D-TET	1	0	0	0	0	0	0	1

Annex E: EUSR AMR in zoonotic and indicator bacteria from humans, animals, and food 2020-2021

STR-PNC-FOX-CIP-ERY-CLI-Q/D-TIA-TMP-TET	0	1	0	0	2	0	0	3
STR-PNC-FOX-CIP-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
STR-PNC-FOX-CIP-ERY-CLI-TET	1	0	0	0	0	0	0	1
STR-PNC-FOX-CIP-TET	1	4	0	0	0	0	0	5
STR-PNC-FOX-CLI-Q/D-TIA-TMP-TET	0	2	0	0	0	0	0	2
STR-PNC-FOX-ERY-CLI-Q/D TIA-TMP-TET	1	10	0	0	0	1	0	12
STR-PNC-FOX-ERY-CLI-TET	4	0	0	0	0	0	0	4
STR-PNC-FOX-ERY-CLI-TMP-TET	0	0	0	0	1	0	0	1
STR-PNC-FOX-TET	0	16	0	0	0	0	0	16

PNC= penicillin, FOX= cefoxitin, CIP= ciprofloxacin, TET= tetracycline, ERY= erythromycin, CLI= clindamycin, TMP= trimethoprim, GEN= gentamicin, KAN= kanamycin, Q/D= quinupristin/dalfopristin, STR= streptomycin, CHL= chloramphenicol, TIA= tiamulin, RIF= rifampicin, SMX= sulfamethoxazole
 Note: Isolates are counted if the pattern is included, irrespective of additional resistance traits.

Table 8b: Frequently occurring MDR-patterns in MRSA-isolates from animals and food 2020.

MDR-patterns in MRSA-isolates	Turkeys (Belgium, n=2)	Broilers (Belgium, n=2)	Broiler meat (Austria, n=8)	Sheep meat (Germany, n=11)	Total
PNC-FOX-TET	2	2	8	6	18
PNC-FOX-TET-ERY	1	1	5	3	10
PNC-FOX-ERY	1	1	5	5	12
PNC-FOX-TET-ERY-CLI	1	1	4	2	8
PNC-FOX-TET-ERY-CLI -TMP	1	1	1	2	5
PNC-FOX-TET-ERY-CLI-Q/D-TIA	0	0	3	1	4
PNC-FOX-TMP	2	1	4	3	10
PNC-FOX-TET-TMP-	2	1	4	2	9

PNC= penicillin, FOX=cefoxitin, TET= tetracycline, ERY= erythromycin, CLI= clindamycin, TMP= trimethoprim, Q/D= quinupristin/dalfopristin
 Note: Isolates are counted if the pattern is included, irrespective of additional resistance traits.

Table 9a: MRSA *spa*-type characterisation, 2021

Category	Country	Animal/ food type	Sample type/unit	No. of isolates	Where reported				Inferred ST/CC	LA, CA or HA	Inferred ST/CC & type
					<i>spa</i> - type(s)	PVL status/IEC genes	ST/CC	<i>mec</i> gene			
Food- producing animals	BE	Veal calves (<1yr)	Herd, nasal swab, OFM	79/145	t386 (1)	-	ST1/CC1	-	-		CC1/LA
					t011 (65)	-	CC398	-	-	LA	CC398/LA
					t034 (6)	-	CC398	-	-	LA	CC398/LA
					t1451 (1)	-	CC398	-	-	LA	CC398/LA
					t1456 (1)	-	CC398	-	-	LA	CC398/LA
					t2346 (1)	-	CC398	-	-	LA	CC398/LA
					t2370 (1)	-	CC398	-	-	LA	CC398/LA
					t3423 (1)	-	CC398	-	-	LA	CC398/LA
					t5210 (1)	-	CC398	-	-	LA	CC398/LA
					t6228 (1)	-	CC398	-	-	LA	CC398/LA
		Dairy cows	Herd, nasal swab, OFM	15/128	t037 (3)	-	ST239/CC8	-	-	CA or HA	CC8/CA
					t011 (10)	-	CC398	-	-	LA	CC398/LA
					t034 (2)	-	CC398	-	-	LA	CC398/LA
Cattle	Herd, nasal swab, OFM	4/85	t037 (2)	-	ST239/CC8	-	-	CA or HA	CC8/CA		
			t011 (2)	-	CC398	-	-	LA	CC398/LA		
Food	AT	Cattle meat	Fresh-ARM	15/326	t095 (7)	-	ST45	-	CC45	HA	CC45/HA
					t011 (4)	-	ST398	-	CC398	LA	CC398/LA
					t034 (1)	-	ST398	-	CC398	LA	CC398/LA
					t898 (1)	-	ST399	-	-		Not clear
					t588 (1)	-	ST402	-	-		Not clear
					t034 (1)	-	ST4561	-	-		Not clear
	DE	Cattle meat	Fresh-BCP	8/73	t1346 (1)	-	ST72/CC8	-	-	CA or HA	CC8/CA
					t002 (2)	-	-	-	ST5/CC5	likely CA	CC5/CA
					t008 (2)	-	-	-	CC8	CA or HA	CC8/CA
					t311 (2)	-	-	-	ST5/CC5	HA or CA	CC5/not clear
					t2112 (1)	-	-	-	CC97	LA	CC97/LA
	DE	Cattle meat	Fresh (chilled)- ARM	15/405	t174 (1)	-	ST41110/CC1	-	-		CC1/LA
					t011 (4)	-	-	-	CC398		CC398/LA
					t034 (4)	-	-	-	CC398		CC398/LA
					t359 (1)	-	-	-	CC97	LA	CC97/LA

					t559 (1)	-	-	-	CC1		CC1/LA
					t843 (1)	-	-	<i>mecC</i>	CC130		CC130/LA
					t899 (1)	-	-	-	CC9/CC398	LA	CC9/CC398/LA
					t1430 (1)	-	-	-	CC9	LA	CC9/LA
					t1451 (1)	-	-	-	CC398		CC398/LA
	AT	Pig meat	Fresh-ARM	59/319	t899 (5)		ST9		CC9	LA	CC9/CC398/LA
t1430 (9)						ST9		CC9	LA	CC9/LA	
t095 (11)						ST45		CC45	HA	CC45/HA	
t011 (22)						ST398		CC398	LA	CC398/LA	
t034 (12)						ST398		CC398	LA	CC398/LA	
t1793 (1)						ST398		CC398	LA	CC398/LA	
t2576 (1)						ST398		CC398	LA	CC398/LA	
t9013 (1)						ST398		CC398	LA	CC398/LA	
t588 (1)						ST400				Not clear	
t011 (2)								CC398	LA	CC398/LA	
t571 (1)								CC398	LA	CC398/LA	
					FI	Pig meat	Fresh (chilled)-NS	26/206	t728 (1)	-	ST45/CC45
t034 (14)	-	ST398/CC398	-	-					LA	CC398/LA	
t899 (1)	-	ST398/CC398	-	-					LA	CC398/LA	
t2741 (9)	-	ST398/CC398	-	-					LA	CC398/LA	
t4677 (1)	-	ST398/CC398	-	-					LA	CC398/LA	
	DE	Pig meat	Fresh- BCP	1/7	t1430 (1)	-	-	-	CC9	LA	CC9/LA

BE: Belgium; DE: Germany; FI: Finland; ARM: At retail monitoring; BCP: Border control points; NS: National Survey; OFM: On-farm monitoring.

-: Not reported; ST: sequence type; CC: clonal complex; *mecC*: variant of the *mecA* gene, sharing 70% identity with *mecA* at the DNA level; CA: community-associated; HA: healthcare-associated; LA: livestock-associated.

Note: the green columns show the livestock-associated MRSA, blue columns show hospital-associated MRSA, the red columns show the community-associated MRSA.

Table 9b: MRSA *spa*-type characterisation, 2020

Category	Country	Animal/ food type	Sample type/unit	No. of isolates	Where reported				Inferred ST/CC	LA, CA or HA	Inferred ST/CC & type
					<i>spa</i> -type(s)	PVL status / IEC genes	ST/CC	<i>mec</i> gene			
Food-producing animals	BE	Broilers	Flock, nasal swabs, OFM	2/60	t011 (2)	-	CC398	-	-	LA	CC398 / LA
		Fattening turkeys	Flock, nasal swabs, OFM	2/18	t011 (2)	-	CC398	-	-	LA	CC398 / LA
Food	AT	Broiler meat	Fresh – ARM	8/306	t011 (4)	-	CC398	-	-	LA	CC398 / LA
					t034 (4)	-	CC398	-	-	LA	CC398 / LA
Food	DE	Meat from sheep	Fresh – ARM	11/386	t011 (1)	-	-	-	CC398	LA	CC398 / LA
					t034 (2)	-	-	-	CC398	LA	CC398 / LA
					t223 (2)	-	-	-	CC22	HA	CC22/HA
					t267 (1)	-	-	-	CC97	LA	CC97/LA
					t1154 (1)	-	ST5	-	-	HA	CC5 / HA
					t1451 (1)	-	-	-	CC398	LA	CC398 / LA
					t2576 (1)	-	-	-	CC398	LA	CC398 / LA
					t15010 (1)	-	ST97	-	-	LA	CC97/LA
t19979 (1)	-	CC398	-	-	LA	CC398 / LA					

BE: Belgium; DE: Germany; AT: Austria; ARM: At retail monitoring; OFM: On-farm monitoring.

-: Not reported; ST: sequence type; CC: clonal complex; mecC: variant of the *mecA* gene, sharing 70% identity with *mecA* at the DNA level; CA: community-associated; HA: healthcare-associated; LA: livestock-associated.

Note: the blue columns show hospital-associated MRSA and green columns show the livestock-associated MRSA.