

Annex C - Antimicrobial resistance in *Campylobacter* spp.

Annex to:

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C.1. Antimicrobial resistance in *Campylobacter* spp. from humans

Table 1: Antimicrobial resistance in *Campylobacter jejuni* from humans per country in 2019

Country	Gentamicin		Co-amoxiclav		Ciprofloxacin		Erythromycin		Tetracycline	
	N	% Res	N	% Res	N	% Res	N	% Res	N	% Res
Austria	410	0	-	-	410	76.1	410	0.2	410	45.6
Bulgaria ^(a)	-	-	-	-	25	28.0	25	4.0	25	36.0
Cyprus	-	-	-	-	29	93.1	29	0	29	58.6
Denmark	158	2.5	-	-	158	65.2	158	0.6	158	43.7
Estonia	268	0	-	-	268	92.9	268	0.7	268	49.3
Finland	-	-	-	-	3,014	68.0	3,025	1.8	1,529	43.8
France ^(a)	5,838	0.3	6,503	0.1	6,518	58.8	6,522	0.5	6,510	46.2
Italy	86	2.3	-	-	86	79.1	86	1.2	86	47.7
Lithuania ^(a)	-	-	-	-	751	95.1	756	0.8	547	47.7
Luxembourg	237	0	237	0.4	237	54.9	237	0.4	237	48.9
Malta	2	NA	2	NA	198	67.7	197	0.5	4	NA
Netherlands ^(a)	-	-	-	-	1,410	67.8	1,416	2.5	1,282	52.4
Poland ^(a)	3	NA	5	NA	28	67.9	82	1.2	26	57.7
Portugal	302	0.3	-	-	302	92.7	302	4.6	302	77.8
Romania	8	NA	8	NA	8	NA	8	NA	8	NA
Slovakia ^(a)	-	-	27	51.9	1,161	85.5	453	2.6	880	73.2
Slovenia	-	-	-	-	958	76.5	958	0.8	958	31.7
Spain	216	0.9	216	15.7	216	89.4	216	2.3	215	79.1
United Kingdom ^(a)	-	-	-	-	7,842	47.4	7,062	2.4	3,836	42.2
Total (19 MSs)	7,528	0.3	6,998	0.8	23,619	61.5	22,210	1.5	17,310	47.2
Iceland ^(a)	-	-	-	-	82	37.8	82	1.2	-	-
Norway	221	0.5	-	-	221	30.8	221	1.4	221	21.3

N: number of isolates tested; % Res: percentage of resistant isolates [note: in this report either interpreted as non-wild type by ECOFFs or clinically non-susceptible by combining resistant and intermediate categories]; -: no data reported; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; PWA: population-weighted average; MSs: Member States.

(a) Provided interpreted SIR data.

Table 2: Antimicrobial resistance in *Campylobacter coli* from humans per country in 2019

Country	Gentamicin		Co-amoxiclav		Ciprofloxacin		Erythromycin		Tetracycline	
	N	% Res	N	% Res	N	% Res	N	% Res	N	% Res
Austria	51	0	-	-	51	88.2	51	3.9	51	64.7
Bulgaria ^(a)	-	-	-	-	4	NA	4	NA	4	NA
Cyprus	-	-	-	-	9	NA	9	NA	9	NA
Estonia	45	2.2	-	-	45	86.7	45	24.4	45	80.0
Finland	-	-	-	-	348	87.1	353	22.7	178	67.4
France ^(a)	969	1.3	1,058	0.5	1,061	61.8	1,061	7.2	1,060	75.8
Italy	16	18.8	-	-	16	68.8	16	25.0	16	87.5
Lithuania ^(a)	-	-	-	-	61	93.4	61	4.9	61	75.4
Luxembourg	34	0	34	20.6	34	61.8	34	11.8	34	76.5
Malta	1	NA	1	NA	40	75	40	2.5	2	50.0
Netherlands ^(a)	-	-	-	-	139	79.1	139	27.3	124	74.2
Poland ^(a)	-	-	-	-	4	NA	18	0	4	NA
Portugal	52	3.8	-	-	52	96.2	52	73.1	52	98.1
Romania	9	NA	9	NA	9	NA	9	NA	9	NA
Slovakia ^(a)	-	-	1	NA	156	87.2	74	4.1	135	77.8
Slovenia	-	-	-	-	77	74.0	77	1.3	77	41.6
Spain	47	4.3	47	29.8	47	95.7	47	19.1	47	89.4
United Kingdom ^(a)	-	-	-	-	958	34.0	865	12.7	463	35.2
Total (MSs 18)	1,224	1.8	1,150	2.4	3,111	61.2	2,955	12.9	2,371	66.9
Iceland ^(a)	-	-	-	-	2	NA	2	NA	-	-
Norway	7	NA	-	-	7	NA	7	NA	7	NA

N: number of isolates tested; % Res: percentage of resistant isolates [note: in this report either interpreted as non-wild type by ECOFFs or clinically non-susceptible by combining resistant and intermediate categories]; -: no data reported; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; PWA: population-weighted average; MSs: Member States. (a): Provided interpreted SIR data.

Table 3: Proportion of *Campylobacter jejuni* isolates from humans resistant to both ciprofloxacin (CIP) and erythromycin (ERY) per country in 2019

Country	Tested for CIP and ERY (N)	Resistant to both CIP and ERY (%)
Austria	410	0.2
Bulgaria ^(a)	25	0
Cyprus	29	0
Denmark	158	0.6
Estonia	268	0.7
Finland	2,984	1.5
France ^(a)	6,514	0.4
Italy	86	1.2
Lithuania ^(a)	748	0.8
Luxembourg	237	0.4
Malta	197	0.5
Netherlands ^(a)	1,410	1.8
Poland ^(a)	24	0
Portugal	302	4.3
Romania	8	NA
Slovakia ^(a)	432	0.9
Slovenia	958	0.5
Spain	216	2.3
United Kingdom ^(a)	7,038	1.1
Total (MSs 19)	22,044	1.0
Iceland ^(a)	82	0
Norway	221	0.9

N: number of isolates tested; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; PWA: population-weighted average; MSs: Member States. (a): Provided interpreted SIR data.

Table 4: Proportion of *Campylobacter coli* isolates from humans resistant to both ciprofloxacin (CIP) and erythromycin (ERY) per country in 2019

Country	Tested for CIP & ERY (N)	Resistant to both CIP and ERY (%)
Austria	51	3.9
Bulgaria ^(a)	4	NA
Cyprus	9	NA
Estonia	45	24.4
Finland	341	20.8
France ^(a)	1,061	6.4
Italy	16	25.0
Lithuania ^(a)	61	4.9
Luxembourg	34	8.8
Malta	40	2.5
Netherlands ^(a)	139	20.9
Poland ^(a)	4	NA
Portugal	52	73.1
Romania	9	NA
Slovakia ^(a)	73	3
Slovenia	77	2.6
Spain	47	19.1
United Kingdom ^(a)	865	6.8
Total (MSs 18)	2,928	10.4
Iceland ^(a)	2	NA
Norway	7	NA

N: number of isolates tested; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; PWA: population-weighted average; MSs: Member States.

(a): Provided interpreted SIR data.

Table 5: Complete susceptibility and multi-resistance in *Campylobacter jejuni* from humans in 2019*

Country	Susceptible to all (%)	Multi-resistant (%)
Austria (N=410)	21.7	0.0
Denmark (N=158)	33.5	1.9
Estonia (N=268)	6.7	0.4
France (N=5815)	33.0	0.4
Italy (N=86)	17.4	2.3
Luxembourg (N=237)	37.6	0.4
Malta (N=2)	NA	NA
Norway (N=221)	67.0	0.5
Poland (N=1)	NA	NA
Portugal (N=302)	6.0	4.3
Romania (N=8)	NA	NA
Spain (N=215)	7.9	2.3
Total (11 MS+1 Non-MS) (N=7,723)	30.7	0.6

N: number of isolates tested; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; MSs: Member States.

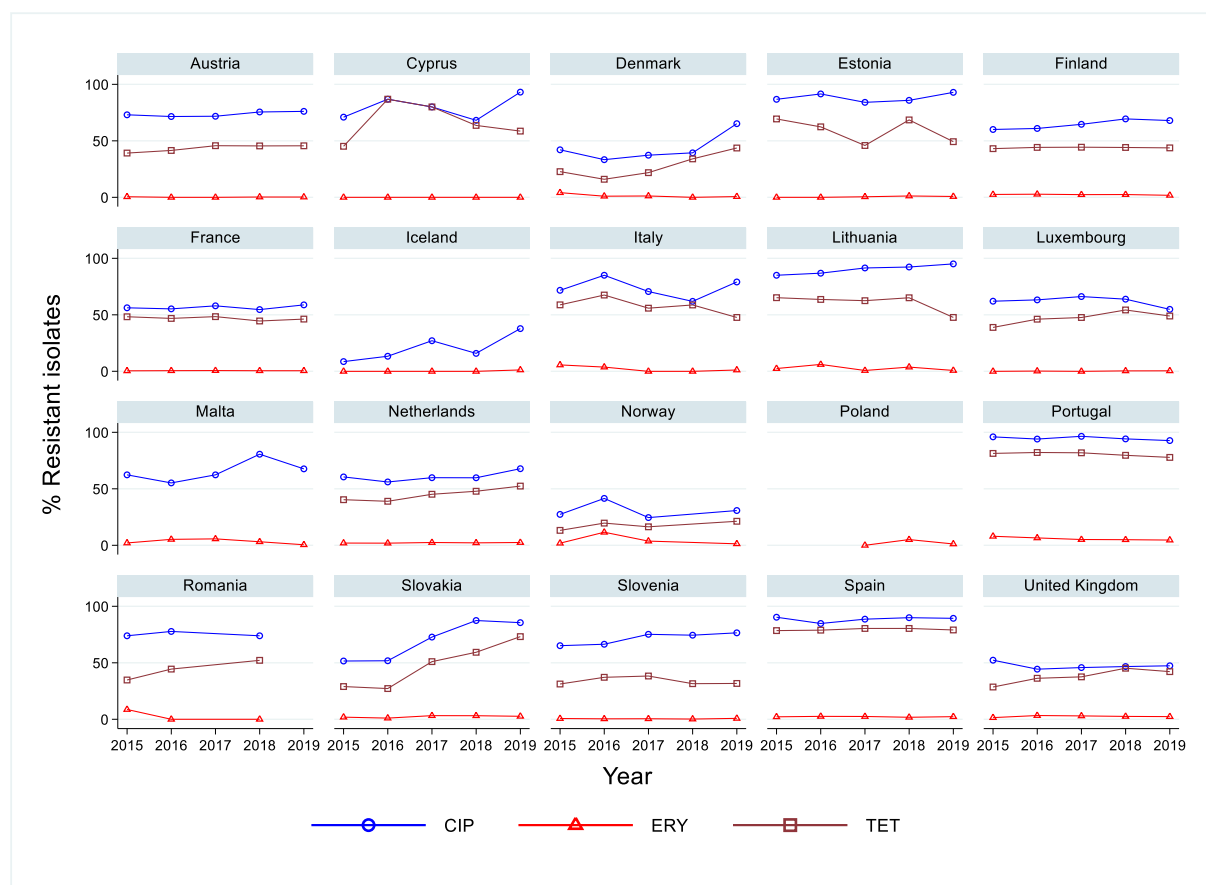
* in countries testing isolates for the harmonised panel of four antimicrobial classes.

Table 6: Complete susceptibility and multi-resistance in *Campylobacter coli* from humans in 2019*

Country	Susceptible to all (%)	Multi-resistant (%)
Austria (N=51)	5.9	2.0
Estonia (N=45)	8.9	24.4
France (N=969)	14.1	6.8
Italy (N=16)	12.5	31.3
Luxembourg (N=34)	17.6	8.8
Malta (N=1)	NA	NA
Norway (N=7)	NA	NA
Portugal (N=52)	1.9	73.1
Romania (N=9)	NA	NA
Spain (N=47)	2.1	14.9
Total (9 MS + 1 Non-MS) (N=1231)	12.6	10.9

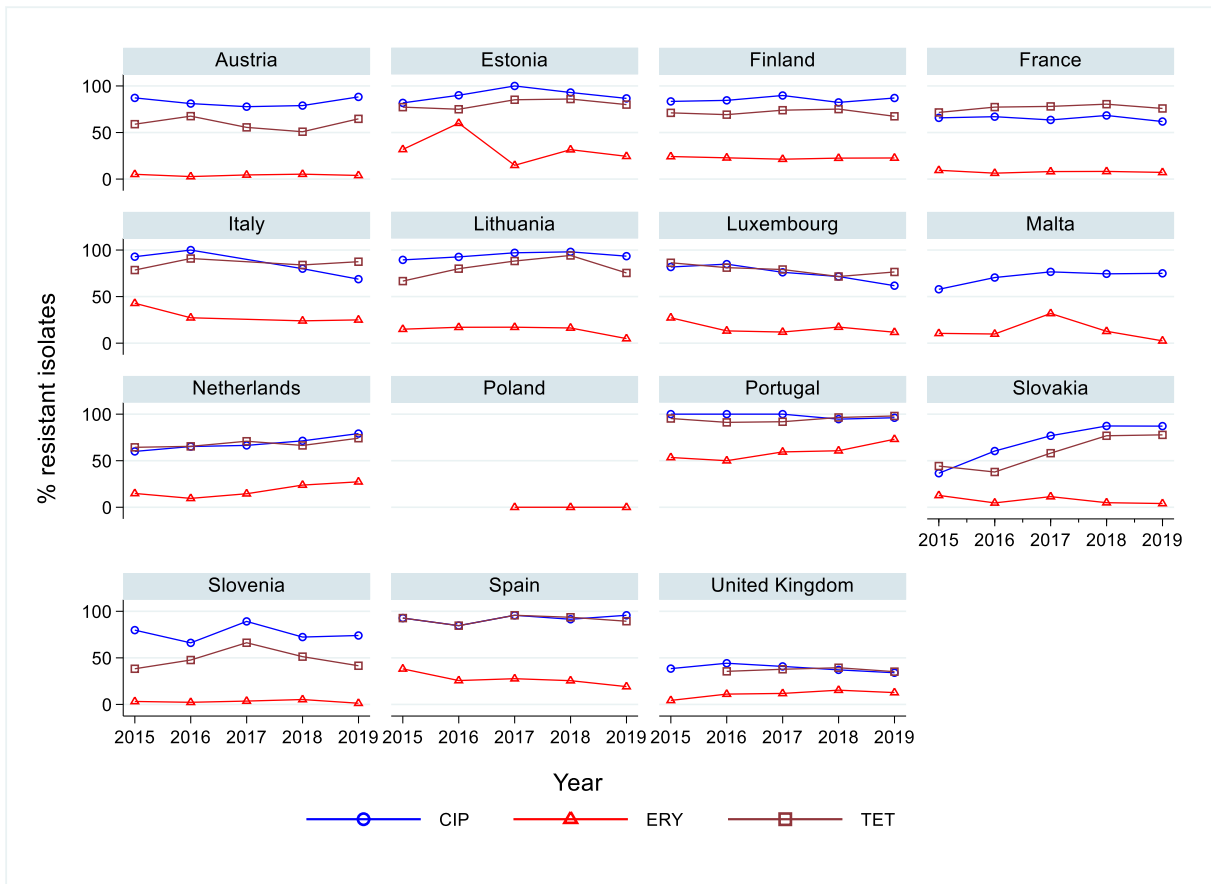
N: number of isolates tested; NA: not applicable – if fewer than 10 isolates were tested resistance was not calculated; MSs: Member States.

* in countries testing isolates for the harmonised panel of four antimicrobial classes.



CIP: ciprofloxacin; ERY: erythromycin; TET: tetracycline.

Figure 1: Trends in ciprofloxacin, erythromycin and tetracycline resistance in *Campylobacter jejuni* from humans in 20 reporting countries, 2015–2019



CIP: ciprofloxacin; ERY: erythromycin; TET: tetracycline.

Figure 2: Trends in ciprofloxacin, erythromycin and tetracycline resistance in *Campylobacter coli* from humans in 15 reporting countries, 2015–2019

C.2. Antimicrobial resistance in *Campylobacter* spp. from food-producing animals and derived meat

Table 7: Overview of data reported in 2018/2019

Year	Species	Origin	MSs	Non- MSs	Total
2018	<i>C. jejuni</i>	Caecal samples of broilers ^m	25 (N=3,519)	4 (N=238)	29 (N=3,757)
		Caecal samples of fattening turkeys ^m	10 (N=1,174)	1 (N=16)	11 (N=1,190)
		Carcase from broilers	4 (N=295)	-	4 (N=295)
		Fresh broiler meat	7 (N=381)	1 (N=112)	8 (N=493)
		Fresh turkey meat	4 (N=86)	-	4 (N=86)
		Broiler meat preparation	4 (N=66)		4 (N=66)
	<i>C. coli</i>	Caecal samples of broilers	6 (N=339)		6 (N=339)
		Caecal samples of fattening turkeys	3 (N=302)		3 (N=302)
		Fresh broiler meat	5 (N=70)	1 (N=24)	6 (N=94)
2019	<i>C. jejuni</i>	Caecal samples of broilers	4 (N=501)		4 (N=501)
		Caecal samples of calves	4 (N=498)		4 (N=498)
		Carcase from broilers	5 (N=70)		5 (N=70)
		Fresh broiler meat	6 (N=399)		6 (N=399)
		Broiler meat preparation	3 (N=53)		3 (N=53)
	<i>C. coli</i>	Caecal samples of broilers	2 (N=201)		2 (N=201)
		Caecal samples of pigs	8 (N=1174)	3 (N=481)	11 (N=1655)
		Caecal samples of calves	2 (N=67)		2 (N=67)

m: mandatory; MSs: Member States; N: Total number of isolates reported by all MSs.

Data are reported for a category when they are reported for at least two countries and a total of 50 isolates

Table 8: Overview of data reported in 2019 for *C. jejuni* isolates from non-legislative food and animal categories, EU

Origin	Origin detailed	N countries	Countries (number of isolates)
Pigs	Pigs - fattening pigs	3	CZ (8), DE (5), ES (1)
Pigeons	Pigeons	1	LU
Cattle (bovine animals)	Cattle (bovine animals) - calves (under 1 year) - veal calves	1	IT (106)
	Cattle (bovine animals)	1	LU
	Cattle (bovine animals) - calves (under 1 year)	2	DE (131), DK (114)
Gallus gallus (fowl)	Cattle (bovine animals) - calves (under 1 year) - for slaughter	1	ES (147)
	Gallus gallus (fowl) - broilers - during rearing period	1	NL (10)
Milk, cows'	Gallus gallus (fowl) - broilers	1	DK (56)
	Milk, cows' - raw milk for manufacture	1	DE (8)
Meat from sheep	Meat from sheep - fresh	1	NL (1)
Meat from broilers	Meat from broilers (Gallus gallus) - carcass - chilled	2	NL (6), RO (20)

(Gallus gallus)	Meat from broilers (Gallus gallus) - carcase	3	HR (41), LU (2), PT (1)
	Meat from broilers (Gallus gallus) - fresh	4	AT (2), BE (72), LU (13), PT (2)
	Meat from broilers (Gallus gallus) - meat preparation	1	BE (4)
	Meat from broilers (Gallus gallus) - fresh - chilled	2	DK (209), NL (54)
	Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked	2	LU (3) NL (46)
Meat from turkey	Meat from turkey - meat preparation - intended to be eaten cooked	1	LU (2)
	Meat from turkey - fresh - chilled	1	NL (4)
Vegetables	Vegetables - pre-cut - non-ready-to-eat	1	NL (1)
Meat from poultry, unspecified	Meat from poultry, unspecified - fresh	1	BE (8)

Table 9: Overview of data reported in 2019 for *C. coli* isolates from non-legislative categories, EU

Origin	Origin detailed	N countries	Countries (number of isolates)
Pigs	Pigs - fattening pigs	1	NL (59)
Cattle (bovine animals)	Cattle (bovine animals) - calves (under 1 year)	2	GE (46), ES (21)
Gallus gallus (fowl)	Gallus gallus (fowl) - broilers	1	NL (3)
Meat from pig	Meat from pig - fresh	1	PT (1)
	Meat from pig - carcase	1	PT (2)
Meat from broilers (Gallus gallus)	Meat from broilers (Gallus gallus) - fresh	4	AT (11), LU (3), NL (9), PT (1)
	Meat from broilers (Gallus gallus) - carcase	2	NL (6), RO (5)
	Meat from broilers (Gallus gallus) - meat preparation	2	LU (8), NL (27)
Meat from turkey	Meat from turkey - fresh	1	LU (1)
	Meat from turkey - meat preparation	2	LU (1), NL (1)
Vegetables	Ready-to-eat salads	1	NL (1)

Table 10: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter jejuni* from broilers, using harmonised ECOFFs, 25 EU MSs and 4 non-MSs, 2018

Country	N	GEN	STR	NAL	CIP	ERY	TET
Austria	177	0.0	7.9	66.7	72.9	0.0	48.6
Bulgaria	95	1.1	14.7	81.1	84.2	7.4	57.9
Croatia	85	0.0	9.4	90.6	91.8	0.0	40.0
Cyprus	79	0.0	13.9	75.9	93.7	0.0	72.2
Czech Republic	236	0.4	4.7	84.3	84.7	1.3	46.2
Denmark	195	0.0	5.1	43.1	43.1	0.0	31.8
Estonia	3	0.0	0.0	100.0	100.0	0.0	33.3
Finland	55	0.0	0.0	25.5	25.5	0.0	0.0
France	174	0.0	1.1	61.5	63.2	0.0	60.3
Germany	175	1.1	4.0	77.7	80.6	1.1	64.0
Greece	117	0.0	11.1	74.4	89.7	0.0	62.4
Hungary	170	0.0	10.0	91.8	91.8	0.0	51.8
Ireland	172	0.0	0.0	23.8	23.8	0.0	41.9
Italy	170	0.0	1.2	64.1	86.5	5.3	68.8
Latvia	64	0.0	32.8	96.9	96.9	0.0	32.8
Lithuania	85	0.0	34.1	95.3	95.3	0.0	87.1
Netherlands	156	0.0	10.3	66.7	70.5	0.0	64.1
Poland	178	0.6	31.5	91.0	93.8	0.0	74.7
Portugal	122	0.0	0.8	94.3	95.1	16.4	92.6
Romania	338	0.0	8.3	85.8	85.8	0.9	62.1
Slovakia	85	1.2	22.4	91.8	88.2	1.2	63.5
Slovenia	85	0.0	1.2	69.4	72.9	0.0	40.0
Spain	157	1.9	11.5	86.6	87.3	0.0	78.3
Sweden	174	0.0	0.6	24.7	24.7	0.0	2.3
United Kingdom	172	1.2	3.5	48.8	48.3	0.6	65.1
Total (25 MSs)	3,519	0.3	8.7	70.5	73.5	1.3	55.4
Iceland	14	0.0	0.0	7.1	7.1	0.0	0.0
Norway	85	0.0	1.2	7.1	7.1	0.0	2.4
Republic of North Macedonia	1	0.0	0.0	0.0	0.0	0.0	0.0
Switzerland	138	0.0	2.9	45.7	45.7	3.6	30.4

ECOFFs: epidemiological cut-off values; MS: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline.

Table 11: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter jejuni* from turkeys, using harmonised ECOFFs, 10 EU MSs and 1 non-MS, 2018

Country	N	GEN	STR	NAL	CIP	ERY	TET
Austria	64	0.0	14.1	68.8	76.6	0.0	35.9
France	183	0.0	0.5	60.7	62.8	0.0	54.1
Germany	120	0.0	2.5	62.5	67.5	0.0	50.0
Hungary	149	0.0	2.7	82.6	83.2	0.0	46.3
Italy	170	0.0	3.5	62.9	78.8	2.9	70.0
Poland	174	0.6	21.8	83.3	90.2	0.0	59.8
Portugal	26	0.0	11.5	88.5	100.0	23.1	100.0
Romania	7	0.0	0.0	57.1	57.1	0.0	57.1
Spain	107	0.0	7.5	82.2	83.2	0.9	71.0
United Kingdom	174	0.0	1.7	31.6	31.0	0.6	44.8
Total (8 MSs)	1,174	0.1	6.4	66.0	71.0	1.1	56.0
Norway	16	0.0	12.5	6.3	6.3	0.0	0.0

ECOFFs: epidemiological cut-off values; MSs: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline.

Table 12: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter coli* from broilers, using harmonised ECOFFs, 6 EU MSs, 2018

Country	N	GEN	STR	NAL	CIP	ERY	TET
Austria	82	0.0	12.2	76.8	75.6	1.2	63.4
Czech Republic	150	3.3	17.3	95.3	96.0	10.7	52.7
Estonia	1	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	62	0.0	4.8	77.4	77.4	4.8	69.4
Slovenia	30	3.3	26.7	90.0	90.0	0.0	66.7
Spain	14	7.1	42.9	92.9	92.9	14.3	100.0
Total (6 MSs)	339	2.1	15.6	86.7	86.7	6.5	61.4

ECOFFs: epidemiological cut-off values; MSs: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline.

Table 13: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter coli* from turkeys, using harmonised ECOFFs, 3 EU MSs, 2018

Country	N	GEN	STR	NAL	CIP	ERY	TET
Austria	54	0.0	16.7	90.7	88.9	0.0	83.3
Germany	185	0.5	11.9	87.6	87.6	24.9	92.4
Spain	63	4.8	41.3	93.6	95.2	7.9	93.6
Total (3 MSs)	302	1.32	18.9	89.4	89.4	16.9	91.1

ECOFFs: epidemiological cut-off values; MSs: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline

Table 14: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter coli* from pigs, using harmonised ECOFFs, 8 EU MSs and 3 non-MSs, 2019

Country	N	GEN	STR	NAL	CIP	ERY	TET
Czechia	307	0.3	74.3	47.6	50.5	7.2	76.9
Estonia	66	0.0	72.7	39.4	39.4	0.0	51.5
Germany	258	0.4	76.7	55.0	55.0	7.0	72.9
Ireland	170	0.0	67.6	32.3	32.3	14.7	69.4
Luxembourg	33	0.0	69.7	66.7	54.5	15.1	69.7
Slovenia	50	8.0	58.0	82.0	84.0	6.0	44.0
Spain	119	12.6	84.9	95.8	95.8	48.7	97.5
Sweden	171	0.0	46.8	36.8	36.8	0.0	0.0
Total (8 MSs)	1 174	1.8	70.0	51.9	52.4	11.2	62.8
Norway	249	0.0	40.96	15.66	15.66	0.00	0.40
Republic of North Macedonia	3	33.3	100.00	33.33	33.33	0.00	33.3
Switzerland	229	0.00	84.72	55.90	55.90	3.93	63.3

ECOFFs: epidemiological cut-off values; MS: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline.

Table 15: Occurrence of resistance (%) to selected antimicrobials in indicator *Campylobacter coli* from calves, using harmonised ECOFFs, 2 EU MSs, 2019

Country	N	GEN	STR	NAL	CIP	ERY	TET
Germany	46	2.2	58.7	80.4	80.4	19.6	93.5
Spain	21	28.6	80.9	80.9	80.9	33.3	95.2
Total (2 MSs)	67	10.4	65.7	80.6	80.6	23.9	94.0

ECOFFs: epidemiological cut-off values; MSs: Member States; N: number of isolates tested; CIP: ciprofloxacin; ERY: erythromycin; GEN: gentamicin; NAL: nalidixic acid; STR: streptomycin; TET: tetracycline

Table 16: Occurrence of resistance () to selected antimicrobials in indicator *Campylobacter jejuni* from calves, using harmonised ECOFFs, 4 EU MSs, 2019

Country	N	GEN	STR	NAL	CIP	ERY	TET
Denmark	114	0.0	2.6	20.2	20.2	0.0	10.5
Germany	131	0.0	10.7	60.3	61.1	0.0	80.1
Italy	106	9.4	13.2	68.9	69.8	0.0	95.3
Spain	147	0.7	26.5	70.7	72.1	0.0	72.8
Total (4 MSs)	498	2.21	14.06	56.02	56.83	0.0	65.3

Table 17: Percentage of *Campylobacter jejuni* isolates from broilers (a) completely susceptible, (b) multiresistant and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2018

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Austria	177	44	24.86	0	0.00	0	0.00
Bulgaria	95	10	10.53	4	4.21	5	5.26
Cyprus	79	2	2.53	0	0.00	0	0.00
Czechia	236	31	13.14	2	0.85	3	1.27
Germany	175	31	17.71	3	1.71	2	1.14
Denmark	195	104	53.33	0	0.00	0	0.00
Estonia	3	0	0.00	0	0.00	0	0.00
Spain	157	16	10.19	3	1.91	0	0.00
Finland	55	41	74.55	0	0.00	0	0.00
France	174	37	21.26	0	0.00	0	0.00
United Kingdom	172	57	33.14	2	1.16	0	0.00
Greece	117	9	7.69	0	0.00	0	0.00
Croatia	85	7	8.24	0	0.00	0	0.00
Hungary	170	10	5.88	0	0.00	0	0.00
Ireland	172	88	51.16	0	0.00	0	0.00
Italy	170	14	8.24	7	4.12	9	5.29
Lithuania	85	4	4.71	0	0.00	0	0.00
Latvia	64	2	3.13	0	0.00	0	0.00
Netherlands	156	42	26.92	0	0.00	0	0.00
Poland	178	9	5.06	0	0.00	0	0.00
Portugal	122	5	4.10	20	16.39	20	16.39
Romania	338	33	9.76	2	0.59	3	0.89
Sweden	174	130	74.71	0	0.00	0	0.00
Slovenia	85	20	23.53	0	0.00	0	0.00
Slovakia	85	5	5.88	2	2.35	0	0.00
Total MS	3,519	751	21.34	45	1.28	42	1.19
Switzerland	138	64	46.38	1	0.72	1	0.72
Iceland	14	13	92.86	0	0.00	0	0.00
Republic of North Macedonia	1	1	100.00	0	0.00	0	0.00
Norway	85	79	92.94	0	0.00	0	0.00

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline. MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 18: Percentage of *Campylobacter coli* isolates from broilers (a) completely susceptible, (b) multiresistant to three or more antimicrobials and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2018

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Austria	82	7	8.54	1	1.22	1	1.22
Czechia	150	4	2.67	20	13.33	16	10.67
Estonia	1	1	100.00	0	0.00	0	0.00
Netherlands	62	10	16.13	3	4.84	3	4.84
Slovenia	30	2	6.67	1	3.33	0	0.00
Spain	14	0	0.00	2	14.29	2	14.29
Total	339	24	7.08	27	7.96	22	6.49

N: total number of isolates; n: number of isolates

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline. MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 19: Percentage of *Campylobacter jejuni* isolates from fattening turkey flocks (a) completely susceptible, (b) multiresistant to three or more antimicrobials and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2018

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Austria	64	10	15.63	0	0.00	0	0.00
Germany	120	31	25.83	0	0.00	0	0.00
Spain	107	12	11.21	1	0.93	1	0.93
France	183	48	26.23	0	0.00	0	0.00
United Kingdom	174	90	51.72	1	0.57	0	0.00
Hungary	149	23	15.44	0	0.00	0	0.00
Italy	170	21	12.35	5	2.94	5	2.94
Poland	174	15	8.62	1	0.57	0	0.00
Portugal	26	0	0.00	6	23.08	6	23.08
Romania	7	3	42.86	0	0.00	0	0.00
Total	1,174	253	21.55	14	1.19	12	1.02
Norway	16	15	93.75	0	0.00	0	0.00

N: total number of isolates; n: number of isolates

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline. MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 20: Percentage of *Campylobacter coli* isolates from fattening pigs (a) completely susceptible, (b) multiresistant to three or more antimicrobials and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2019

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Czechia	307	34	11.07	7	2.28	7	2.28
Estonia	66	21	31.82	0	0.00	0	0.00
Germany	258	40	15.50	10	3.88	11	4.26
Ireland	170	40	23.53	11	6.47	13	7.65
Luxembourg	33	4	12.12	3	9.09	3	9.09
Slovenia	50	3	6.00	3	6.00	3	6.00
Spain	119	0	0.00	58	48.74	57	47.90
Sweden	171	107	62.57	0	0.00	0	0.00
Total	1,174	249	21.21	92	7.84	94	8.01
Norway	249	210	84.34	0	0.00	0	0.00
Republic of North Macedonia	3	2	66.67	1	33.33	0	0.00
Switzerland	229	46	20.09	4	1.75	6	2.62

N: total number of isolates; n: number of isolates

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline.

MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 21: Percentage of *Campylobacter jejuni* isolates from calves (under one-year) (a) completely susceptible, (b) multiresistant to three or more antimicrobials and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2019

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Germany	131	19	14.50	0	0.00	0	0.00
Denmark	114	84	73.68	0	0.00	0	0.00
Spain	147	18	12.24	1	0.68	0	0.00
Italy	106	2	1.89	6	5.66	0	0.00
Total	498	123	24.70	7	1.41	0	0.00

N: total number of isolates; n: number of isolates

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline.

MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 22: Percentage of *Campylobacter coli* isolates from calves (under one-year) (a) completely susceptible, (b) multiresistant to three or more antimicrobials and (c) co-resistant to both ciprofloxacin and erythromycin, per reporting country, 2019

Country	N	n completely susceptible	%	n MDR	%	n co-resistant CIP/ERY	%
Germany	46	1	2.17	9	19.57	8	17.39
Spain	21	0	0.00	9	42.86	7	33.33
Total	67	1	1.49	18	26.87	15	22.39

N: total number of isolates; n: number of isolates

Complete susceptibility is defined as susceptibility to ciprofloxacin, nalidixic acid, erythromycin, gentamicin and tetracycline.

MDR is defined as resistance to at least three antimicrobial substances (panel of antimicrobials tested: ciprofloxacin, nalidixic acid, erythromycin, gentamicin, tetracycline).

Table 23: Number of countries with significantly increasing or decreasing trends in resistance to selected antimicrobials for *C. jejuni* and *C. coli* in broilers (2009-2019), for *C. jejuni* in turkeys (2014-2018) and for *C. coli* in pigs (2009-2019)

Origin	<i>Campylobacter</i> species	Ciprofloxacin		Erythromycin		Tetracycline		Streptomycin	
		Incr.	Decr.	Incr.	Decr.	Incr.	Decr.	Incr.	Decr.
Broilers	<i>C. jejuni</i> (24 MS + 1 non-MS)	12 (AT, HR, CY, CZ, DK, FI, FR, DE, NL, RO, SE, CH)			5 (BG, CY, ES, RO, SK)	14 (AT, BE, HR, CZ, DK, FR, DE, IE, LV, LT, NL, SK, SE, CH)	4 (BG, FI, IT, SI)	9 (AT, BE, HR, CZ, LV, LT, NL, PL, UK)	7 (BG, FI, EL, HU, IE, IT, RO)
	<i>C. coli</i> (8 MS)	3 (HR, DE, NL)	1 (HU)	1 (CZ)	3 (AT, DE, NL)	4 (CZ, DE, HR, NL)	1 (HU)	2 (FR, HR)	3 (ES, HU, NL)
Turkeys	<i>C. jejuni</i> (9 MS)	3 (DE, PO, PT)	2 (HU, ES)		2 (DE, ES)		5 (DE, ES, FR, HU, UK)	2 (AT, PO)	
Pigs	<i>C. coli</i> (7 MS + 2 non-MS)	3 (DE, NO, CH)			4 (HR, ES, NL, CH)	1 (CH)	1 (HR)	3 (HR, NO, CH)	2 (CZ, SE)