

23-24 May 2023

17th EURL-AR Workshop



Monitoring of AMR in food-producing animals and food in the EU

-
2021 EUSR on AMR

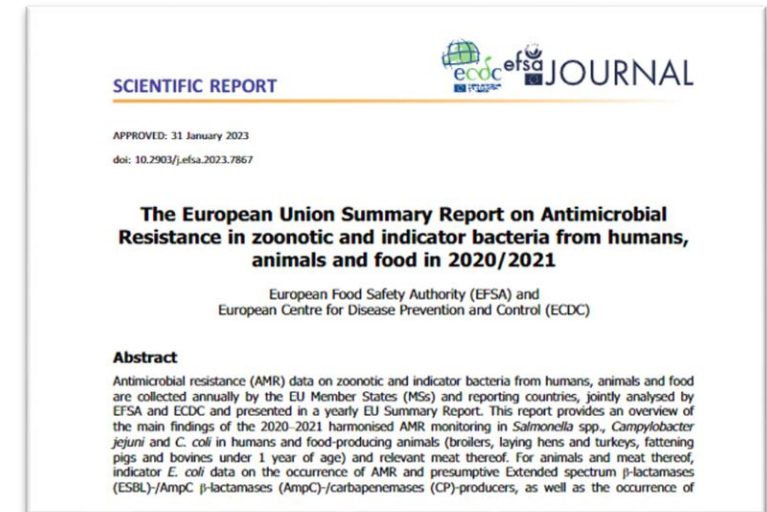
Raquel García Fierro

2021 EUSR on AMR : New Requirements in the new AMR legislation

Commission Implementing Decision 2020/1729/EU

Lays down specific tech. requirements 2021 - 2027

- ➔ Mandatory AMR data for *Salmonella* spp. isolates from:
 - Samples of **caecal content** taken at **slaughter** for fattening pigs
 - Samples of **caecal content** taken at **slaughter** from bovine animals <1 year of age
- ➔ **Imported fresh meat** at **Border Control Post** (BCPs) for *E.coli*
- ➔ New antimicrobial substances
 - **Amikacin** → *Salmonella* spp. and indicator *E.coli*
 - **Chloramphenicol** and **Ertapenem** → *Campylobacter* spp.
- ➔ WGS results



<https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2023.7867>

Data on AMR addressed

- AMR data received from 27 MSs, United Kingdom (Northern Ireland) and 5 non-Mss
- 2020 AMR from poultry flocks and derived meat
- 2021 AMR data from fattening pigs and calves and derived meat

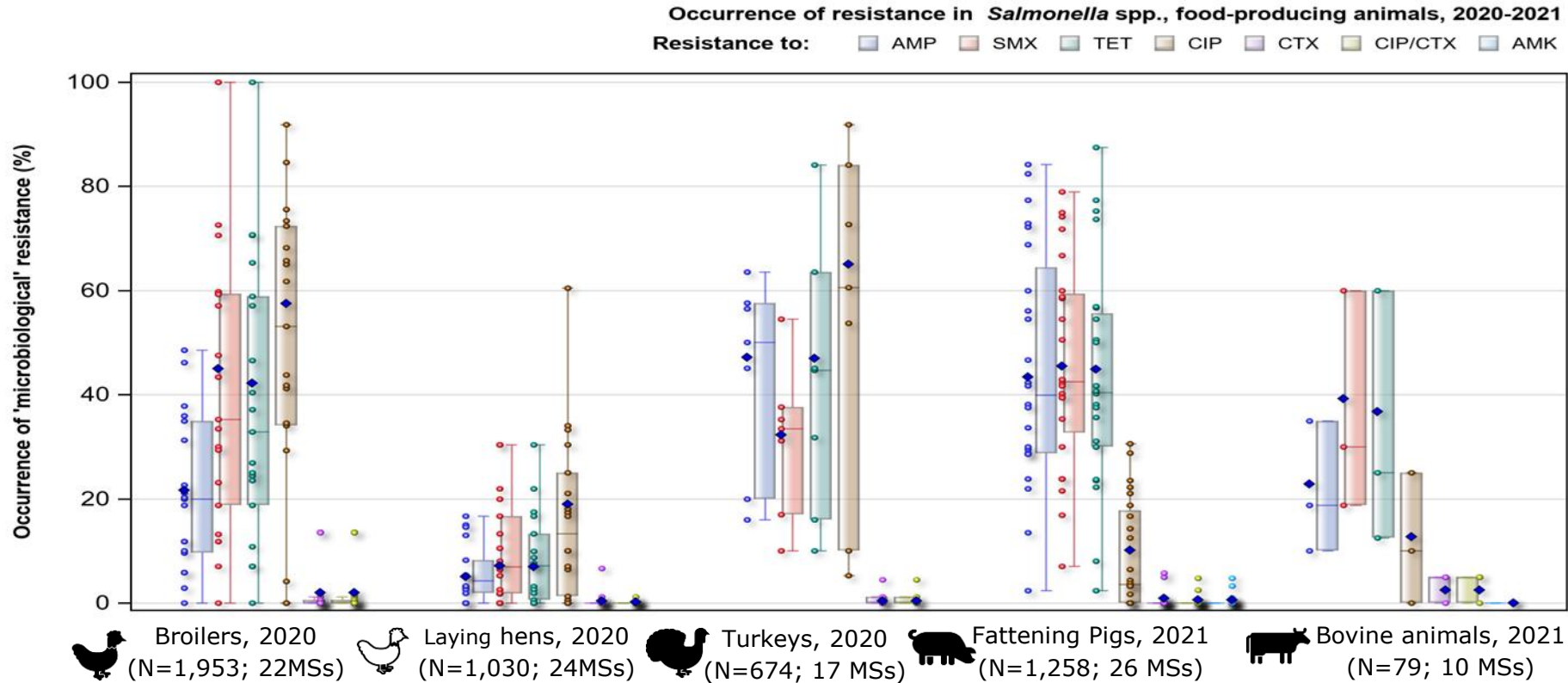



***Salmonella* spp.**



1. AMR - Salmonella spp.

1.1 Levels of resistance



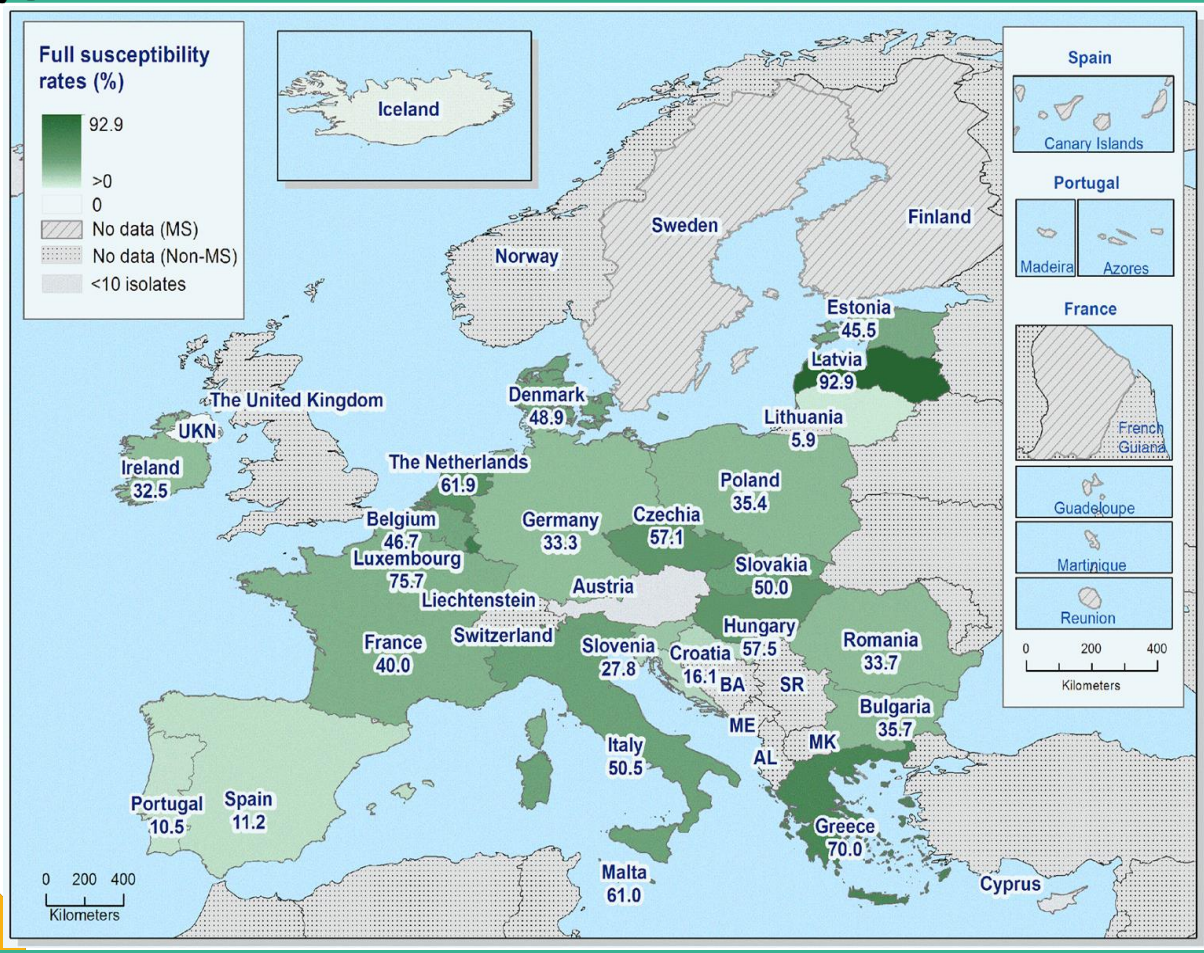
- From **low** (laying hens) to **high** resistance to **AMP**, **SUL** and **TET** → 
- From **moderate** (laying hens, pigs and calves) to **very high** (broilers & turkeys) resistance to **flouroquinolones (CIP)**,
- **Very low/low** resistance to **third generation cephalosporins (CTX)** in animals
- From **very low** (pigs, turkeys and laying hens) to **low** (broilers and calves) **combined resistance to CIP/CTX**
- **Very low** resistance to **AMK** in pigs *and not detected in calves*



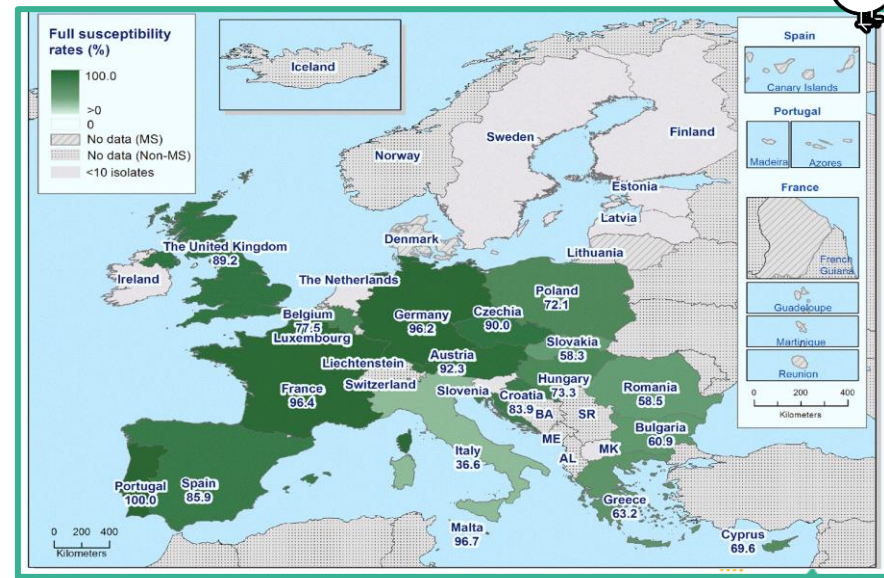
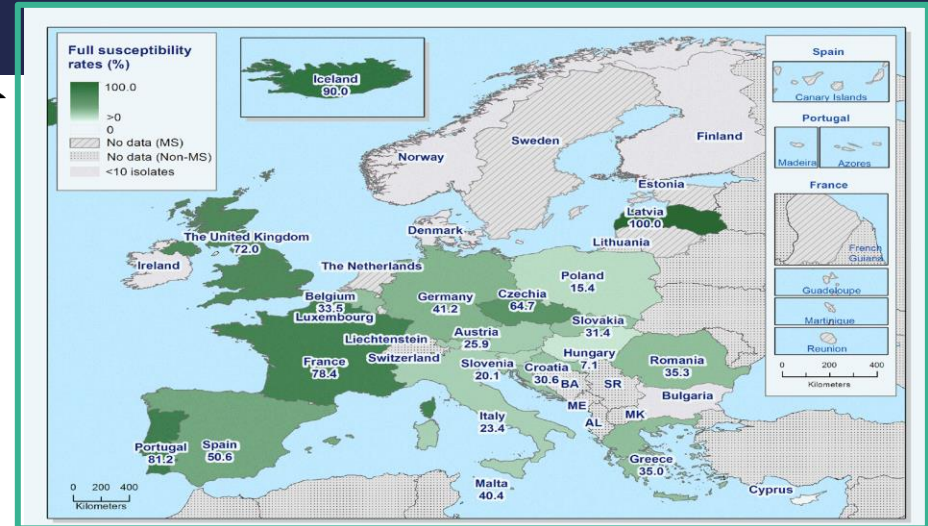
1. AMR - Salmonella spp.

1.2 Complete susceptibility (CS)

2021



2020



- ✓ Marked variations in the levels of CS between reporting countries, particularly in pigs and broilers and turkeys
- ✓ Generally, CS spanned higher levels among isolates from laying hens



1. AMR - Salmonella spp.

1.3 Phenotypic characterisation

Resistance to 3rd Generation cephalosporins

- **Not detected** in turkey carcasses
- Presumptive ESBL- and/or AmpC-producers were observed **at very low levels** in pigs, turkeys, laying hens and broiler carcasses
- Presumptive ESBL and/or AmpC-producers were observed **at low levels** in broilers and bovines

Carbapenem resistance

In 2020 and 2021:

- **None of the Salmonella isolates recovered from any of the animal or carcass origins exhibited 'microbiological' resistance to meropenem**

Table 5: Summary of phenotypic characterisation of third-generation cephalosporin resistance in non-typhoidal *Salmonella* spp. from food-producing animals, animal carcasses and humans, reported in 2020/2021

Matrix	Presumptive ESBL- and/or AmpC-producers ^(a)	Presumptive ESBL-producers ^(b)	Presumptive AmpC-producers ^(c)	Presumptive ESBL + AmpC-producers ^(d)
	n (%R)	n (%R)	n (%R)	n (%R)
Humans – 2020 (N = 5,948, 15 MSs)	45 (0.8)	35 (0.6)	10 (0.2)	1 (0.02)
Humans – 2021 (N = 9,787, 14 MSs)	88 (0.9)	76 (0.8)	12 (0.1)	0
Broiler carcasses – 2020 (N = 905, 18 MSs)	3 (0.3)	2 (0.2)	1 (0.1)	0
Turkey carcasses – 2020 (N = 320, 8 MSs)	0	0	0	0
Broilers – 2020 (N = 1,953, 22MSs)	41 (2.1)	38 (1.9)	3 (0.2)	0
Laying hens – 2020 (N = 1,030, 24 MSs)	4 (0.4)	2 (0.2)	2 (0.2)	0
Fattening turkeys – 2020 (N = 674, 16 MSs)	3 (0.4)	3 (0.4)	0	0
Fattening pigs – 2021 (N = 1,258, 26 MSs)	10 (0.8)	10 (0.8)	2 (0.2)	2 (0.2)
Bovines < 1 year – 2021 (N = 79, 10 MSs)	1(1.3)	1(1.3)	1(1.3)	21 (1.3)

N: Total number of isolates reported by the MSs; n: number of the isolates resistant; %R: percentage of resistant isolates; ESBL: extended-spectrum β-lactamase.

- (a): Isolates exhibiting only ESBL- and/or only AmpC- and/or combined ESBL + AmpC phenotype.
- (b): Isolates exhibiting an ESBL- and/or combined ESBL + AmpC-phenotype.
- (c): Isolates exhibiting an AmpC and/or combined ESBL + AmpC-phenotype.
- (d): Isolates exhibiting a combined ESBL + AmpC phenotype.





Campylobacter spp.

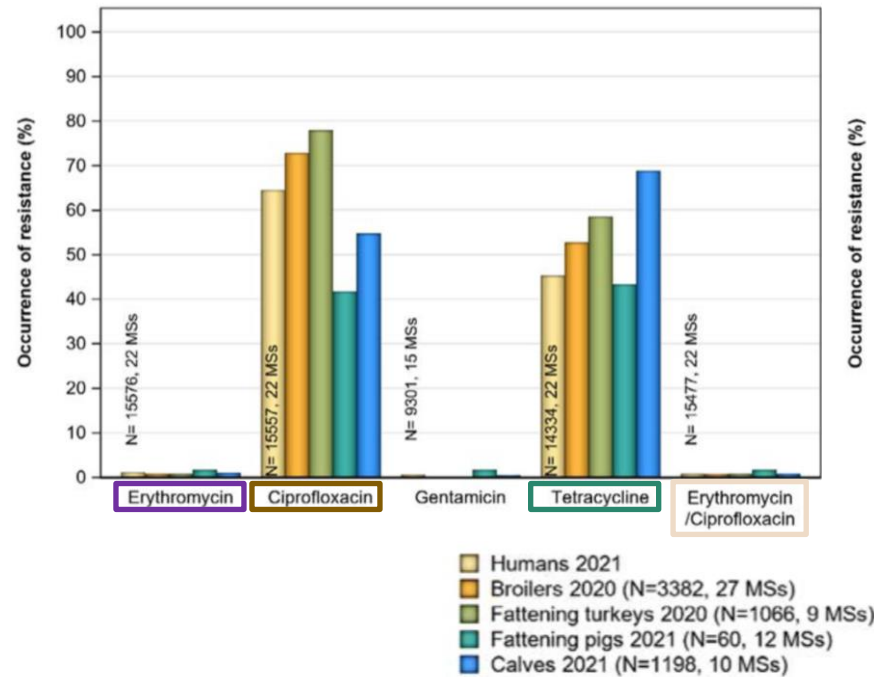


2. AMR – *Campylobacter* spp.

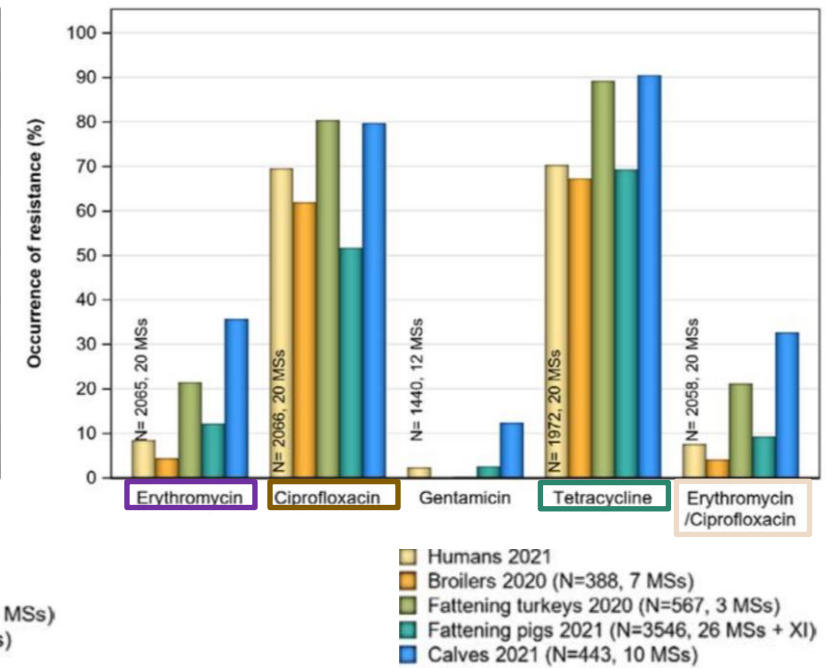
2.1. Levels of resistance

- The level of overall resistance to **tetracycline** ranged from **high** to **extremely high** in food-producing animals in *C. jejuni* and *C. coli*
- Very high** resistance levels to **CIP** in *C. jejuni* and *C. coli* in food-producing animals
- Resistance to **ERY** at **low** levels in *C. jejuni* in animals, while higher levels of resistance detected in *C. coli*
- Combined resistance to **CIP/ERY**:
Rare to low in *C. jejuni* from poultry, pigs and calves
Low in *C. coli* from pigs and broilers, and **moderate** in *C. coli* isolated from fattening turkeys and calves

C. jejuni



C. coli



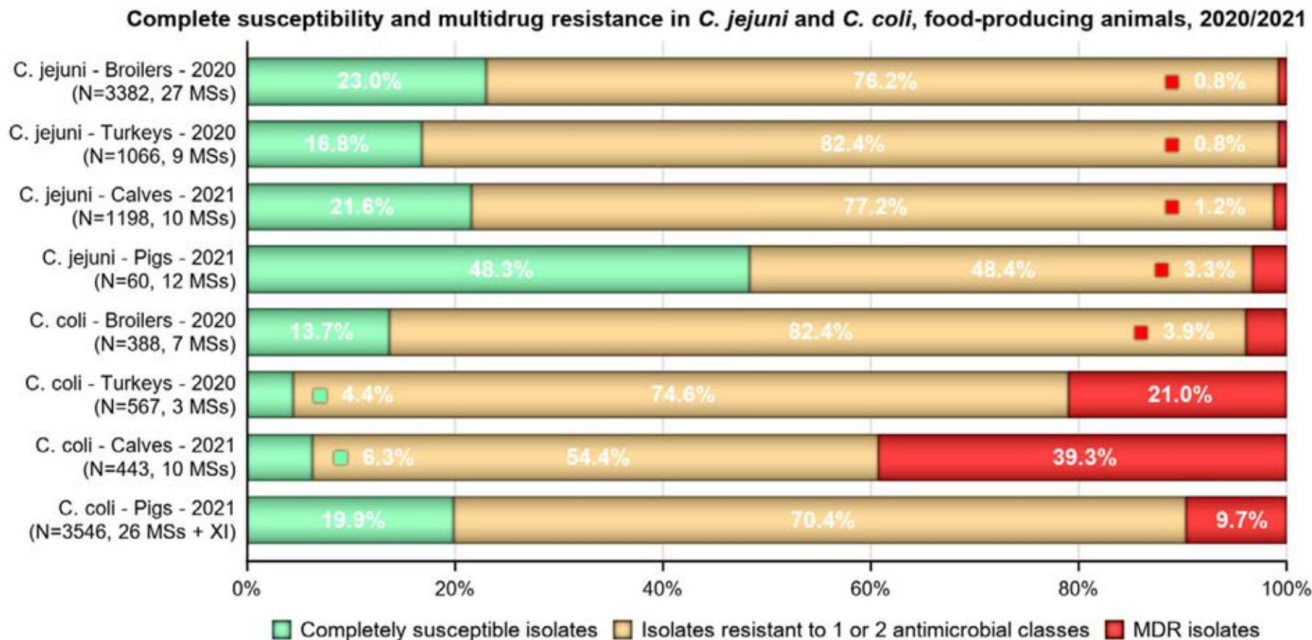
- Resistance to **chloramphenicol** and **ertapenem** in isolates from pigs and calves was either **absent** or **very low**, except for an **unexpected higher level of resistance to ertapenem** reported in *C. coli* isolated from calves in 2021



2. AMR – *Campylobacter* spp.

2.2. MDR and CS

- **Multidrug resistance:** generally low for *C. jejuni* from animals, while it was markedly higher in *C. coli* isolated from calves, pigs and turkeys. These results agree with the higher levels of resistance to selected antimicrobials seen in *C. coli* isolates.
- Overall, **complete susceptibility** (i.e. defined in the report as susceptibility to CIP, ERY, TET and GEN) was higher in *C. jejuni* than in *C. coli* isolates in food-producing animals.





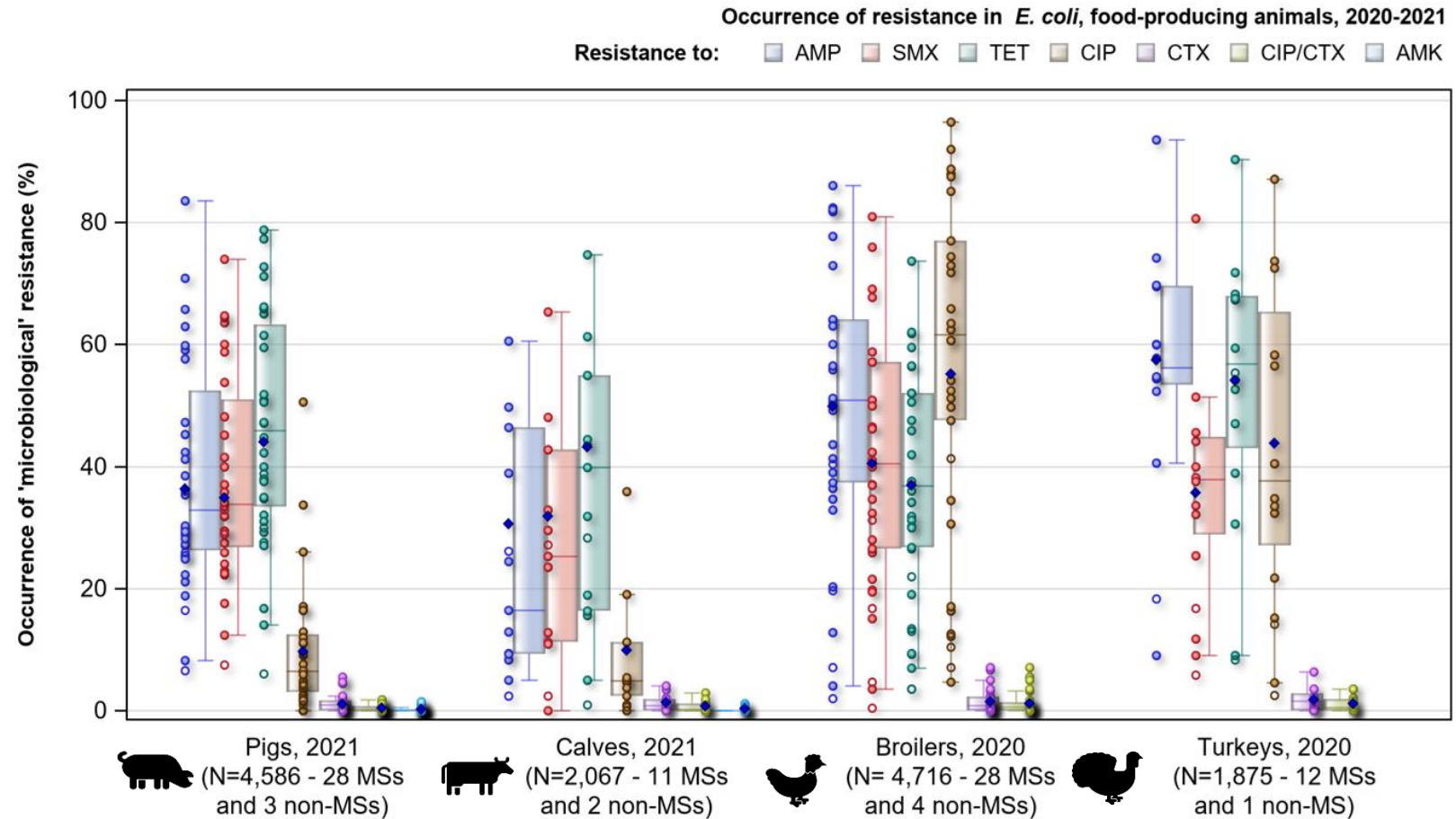
Indicator E. coli



3. AMR - Indicator *E.coli*

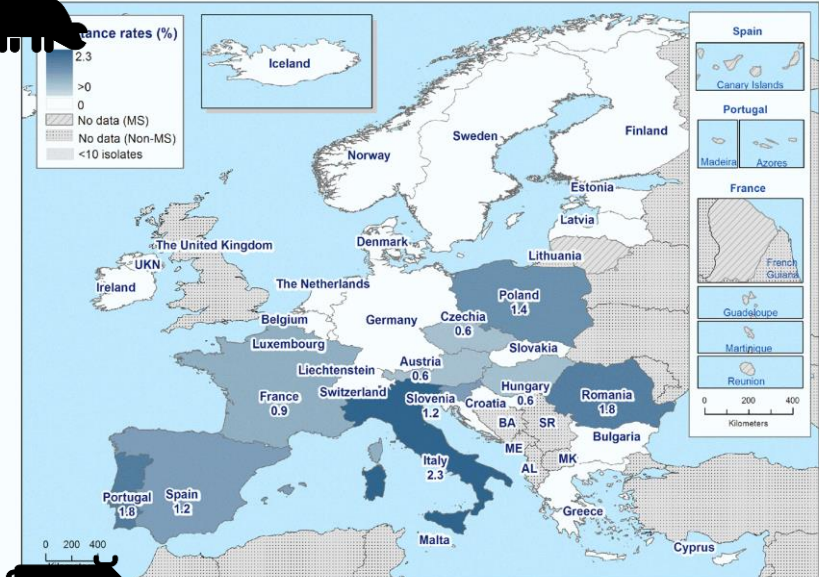
3.1 Levels of resistance

- **High** levels of resistance to commonly used antimicrobials (**AMP**, **SMX**, **TET**)
- **Important resistance** to fluoroquinolones (**CIP**) in broilers and turkeys
- **Low resistance** to cefotaxime (**CTX**)
- Combined resistance to **third-generation cephalosporins** and **fluoroquinolones** (**CIP/CTX**) was generally **uncommon** in all animal categories.
- **Very low** levels of resistance to **AMK**
- Resistance to high priority critically important antimicrobials (**HPCIA**) was **uncommon** for **colistin** and **azithromycin**



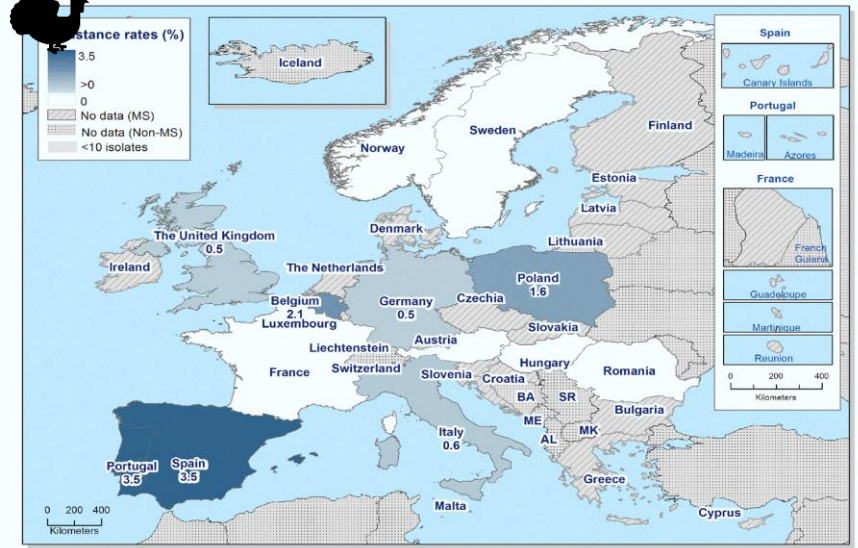
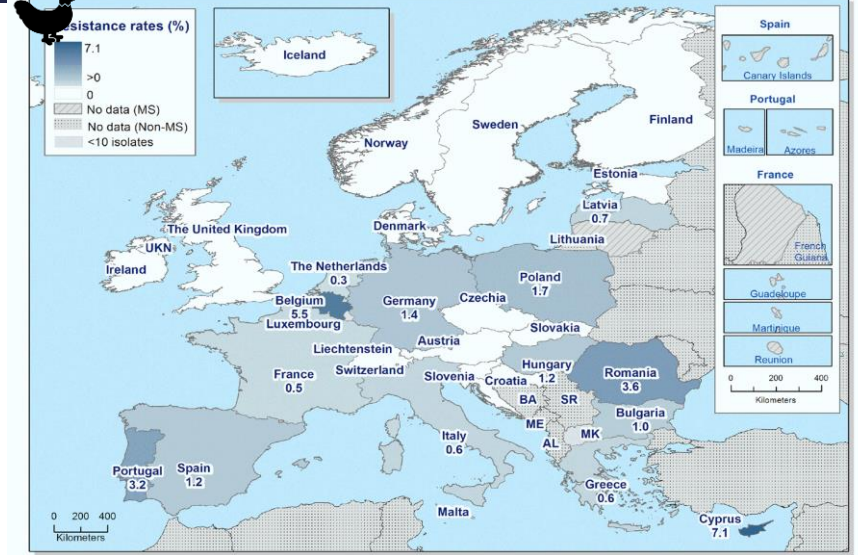
3. AMR - Indicator *E.coli*

3.2 Combined resistance to CIP/CTX



2021

Food-producing animal population	'Microbiological' combined resistance to CIP & CTX (using ECOFFs)			'Clinical' combined resistance to CIP & CTX (using clinical breakpoints)		
	N. Of isolates	% R	95% CI	N. Of isolates	% R	95% CI
Pigs (2021, N=4,586, 28 MSs, 3 non-MSs)	17	0.4	0.2, 0.6	6	0.1	0, 0.3
Calves (2019, N=2,067, 11 MSs, 2 non-MSs)	11	0.5	0, 1.2	2	0.1	0, 0.5
Broilers (2020, N=4,716, MSs, 5 non-MSs)	49	1.0	0, 4.2	24	0.5	0, 3.7
Turkeys (2020, N=1,875, 11 MSs, 2 non-MSs)	19	1.0	0.2, 1.7	8	0.4	0, 0.8
Pig meat from BCP (2021, N=13, 4 MSs)	0	0	0	0	0	0
Bovine meat from BCP (2021, N=110, 6 MSs)	1	0.9	0, 5.0	1	0.9	0, 5.0



2020

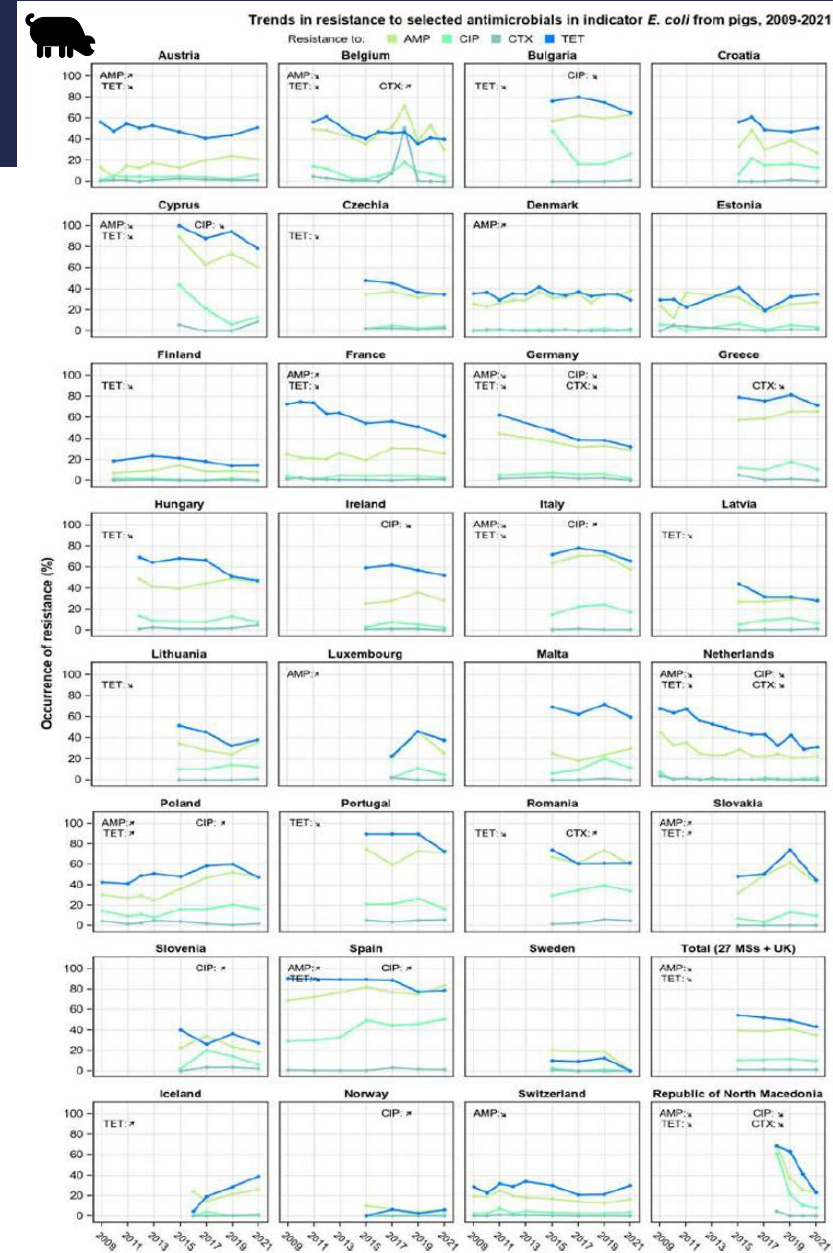
3. AMR - Indicator *E.coli*

3.3 Temporal trends

- Trends of Resistance to **AMP**, **CIP**, **CTX** and **TET**

TET: Decreasing trends in pigs, calves, broilers and turkeys
AMP: Decreasing trends in pigs, broilers and turkeys
CIP: Decreasing trends in broilers
CTX: Decreasing trends in broilers

- Statistically significant
 - Decreasing trends in resistance to **AMP**, **CIP**, **CTX** and **TET**
 - Increasing trends in **CS**
- ... **reveal progress** towards lower levels of resistance in several countries and in the EU group.
- The **improvement** in the situation was most pronounced in **poultry**

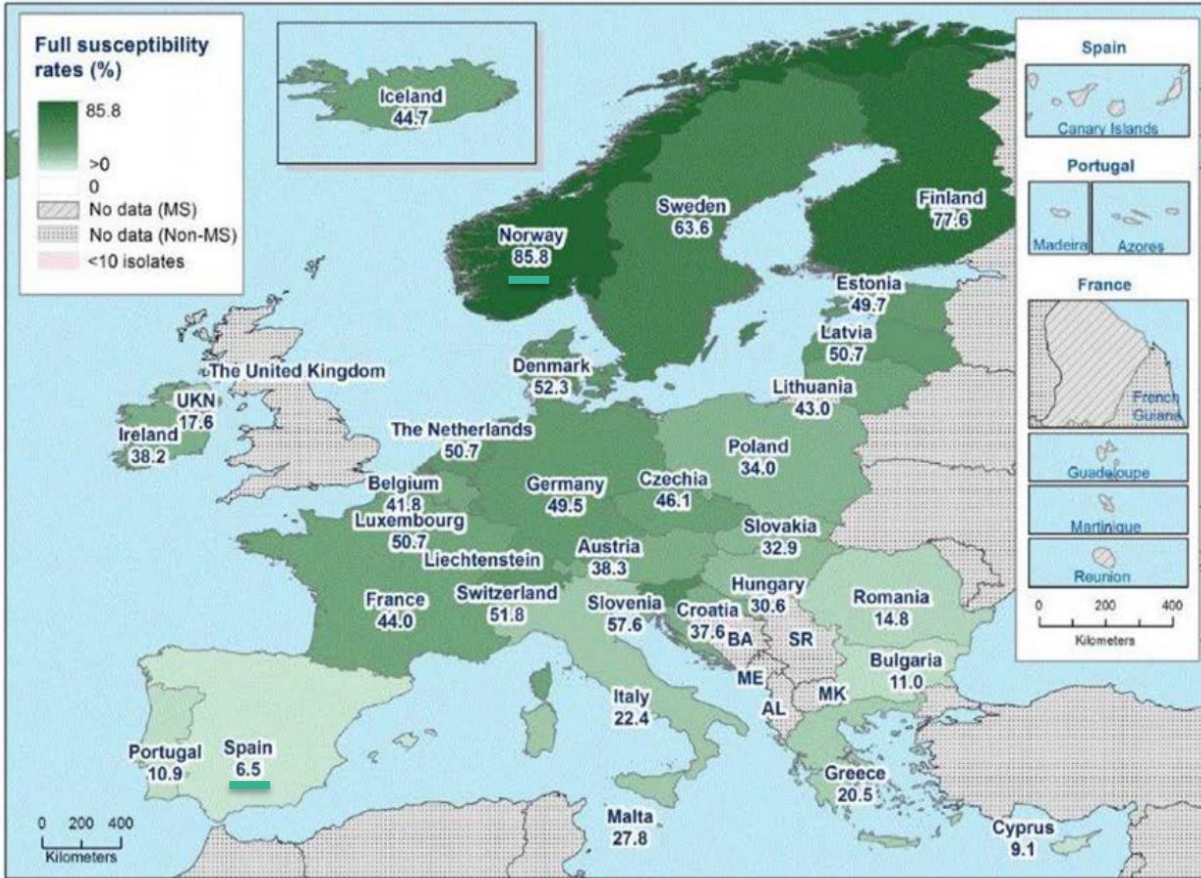


3. AMR- Indicator *E.coli*

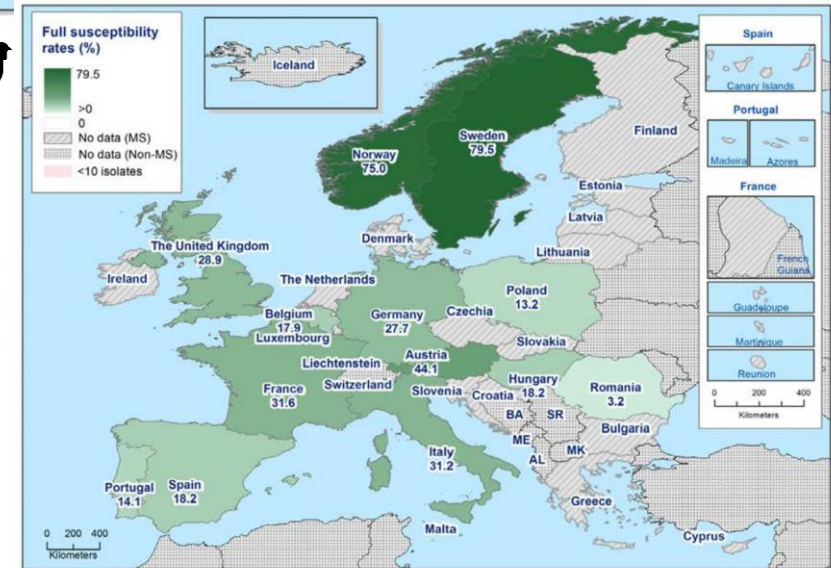
3.2 Complete susceptibility (CS)



2021



2020

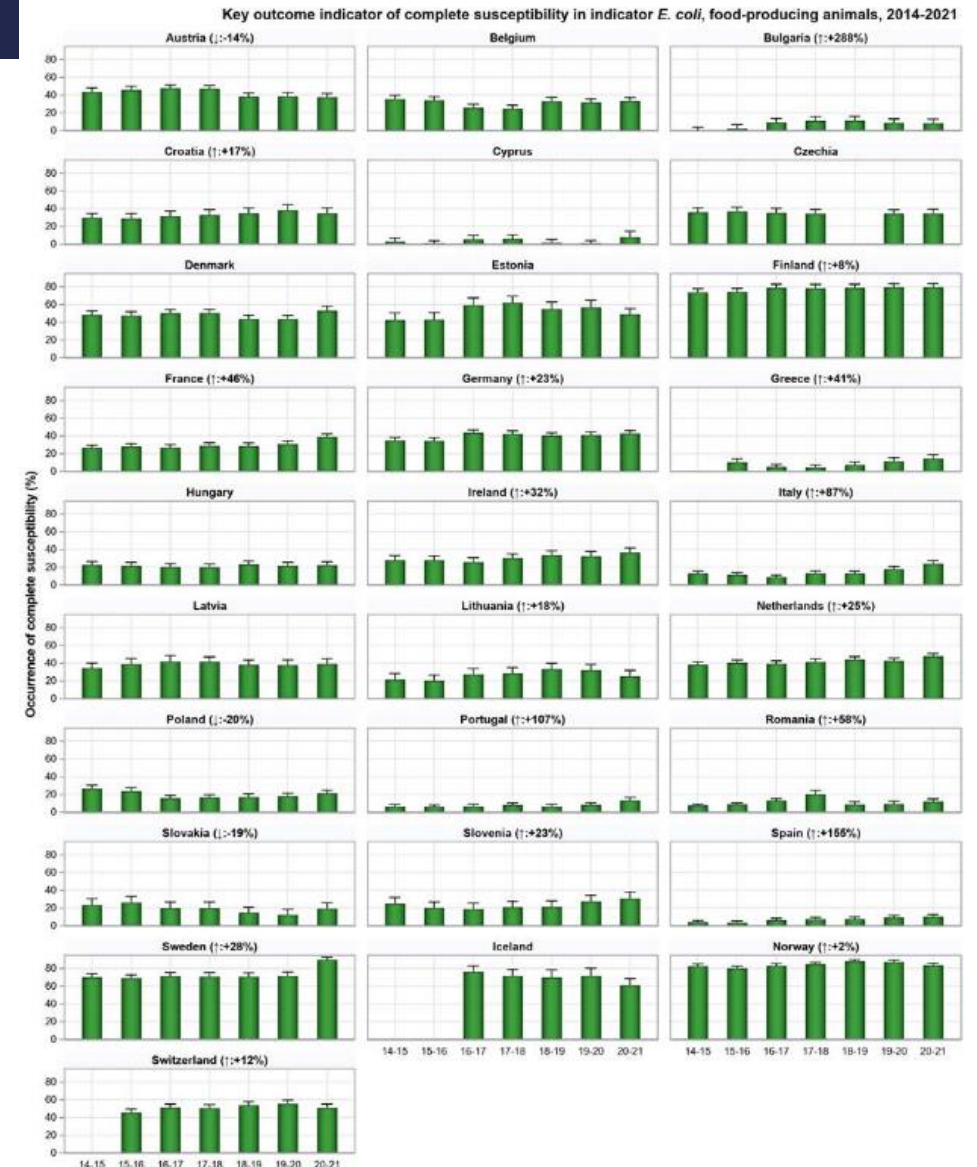


- CS more common in fattening pigs and calves than in broilers and fattening turkeys
- Marked variations between countries: a North to South gradient / An East to South gradient

3. AMR- Indicator *E.coli*

3.2 Key Outcome indicator on Complete susceptibility (KOI_{CS})

- Marked variations among the 28 reporting countries.
- Statistically significant **increasing** trends in 17 countries
- Statistically significant **decreasing** trends in 3 countries
- Levels of KOI_{CS} were:
 - <20% in ten countries,
 - 20-40% in twelve countries,
 - 40-60% in four countries,
 - 60-80% in one country (SE) and
 - >80% in three countries (FI, IS, NO)
- **Lower KOI_{CS}** were generally observed in countries **in eastern and southern Europe** and the highest in countries in the northern Europe





ESBL

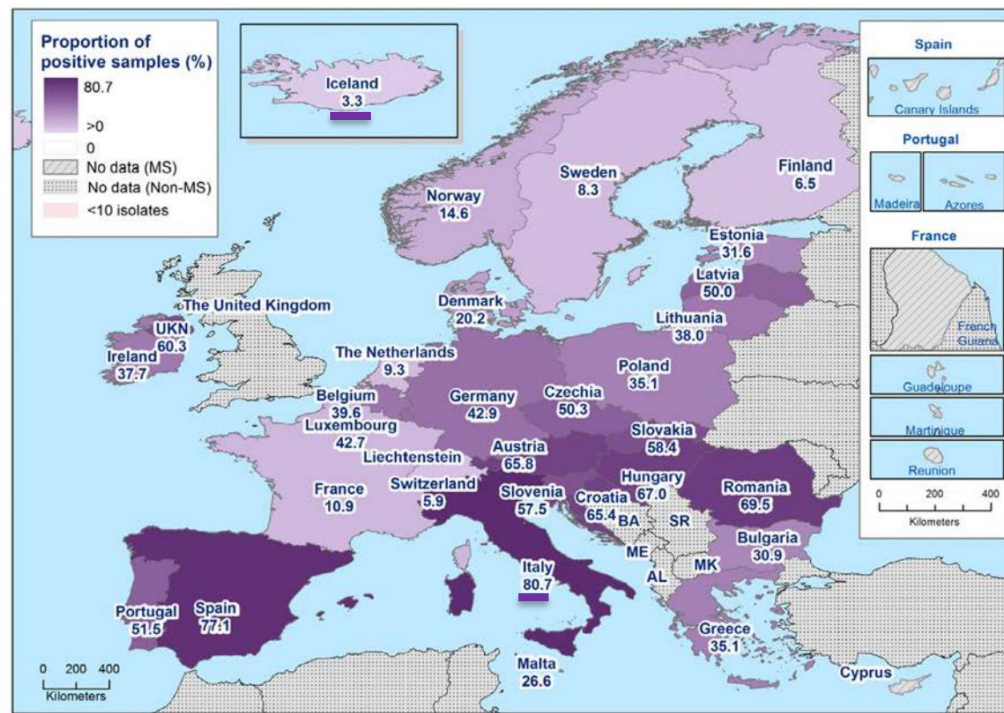
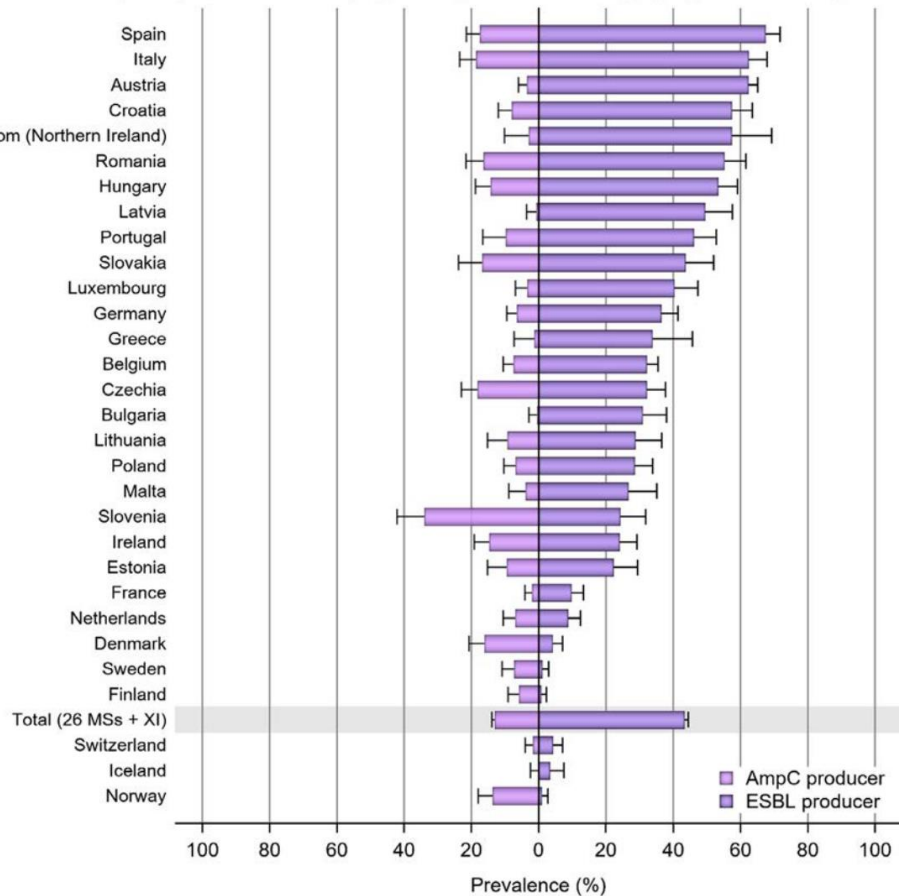


4. AMR - ESBL and/or AMPC- producing *E.coli*

4.1 Prevalence



(b) Prevalence of presumptive ESBL- and AmpC-producing *E. coli* in fattening pigs, specific monitoring, 2021



Genotypic data from:
Czechia
Germany
Finland
Italy

Marked variations in the prevalence of presumptive ESBL and/or AmpC-producers between countries

Trend: ↓ in the occurrence of ESBL in food producing animals observed in 48% of the MSs

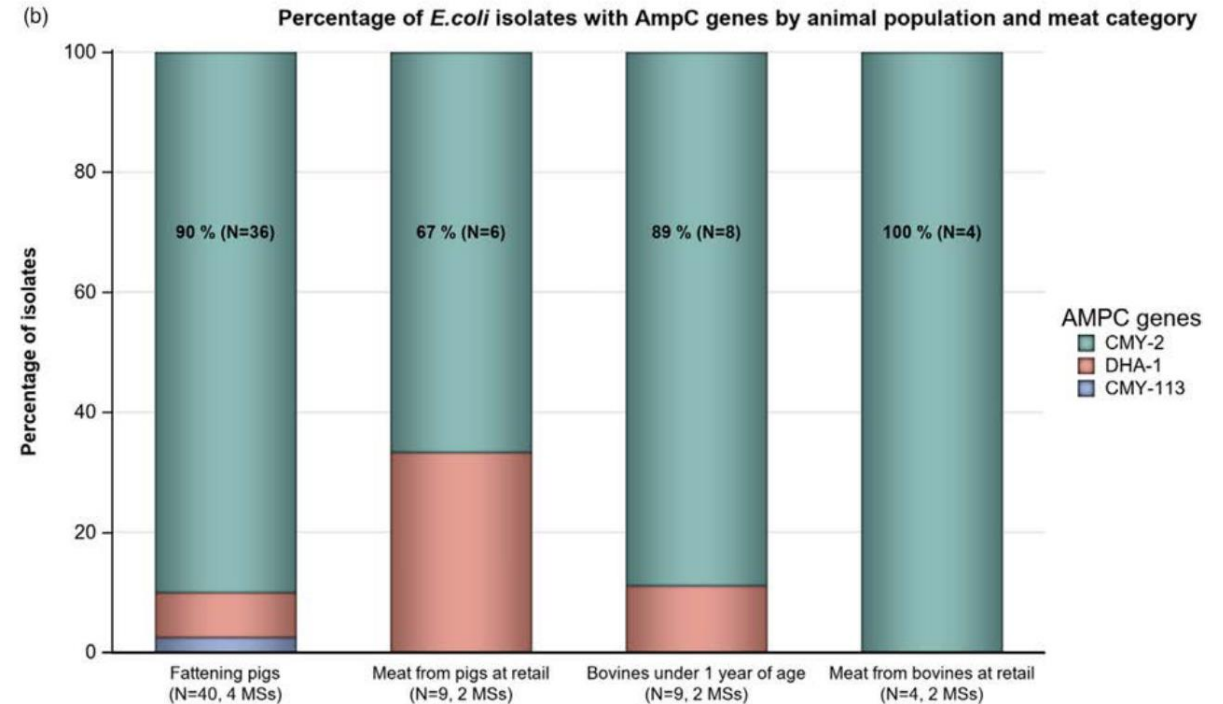
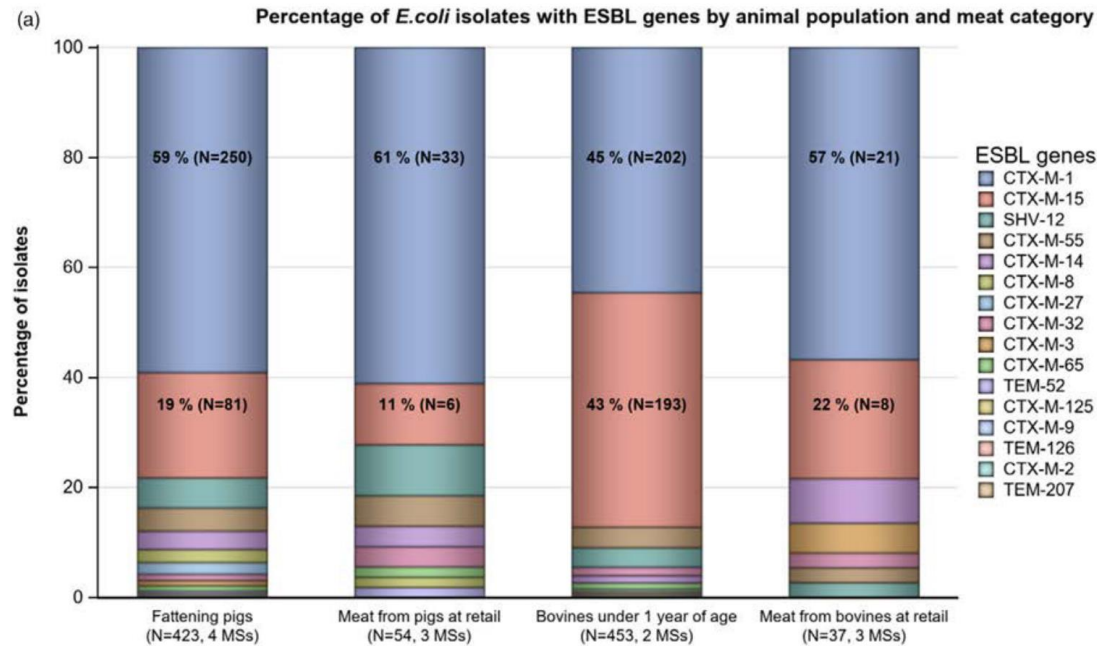


4. AMR - ESBL and/or AMPC- producing *E.coli*

4.2 WGS results

Genotypic data reported from 4 MSs

Czechia
Germany
Finland
Italy



4. AMR - ESBL and/or AMPC- producing *E.coli*

4.3 CP- producing isolates

- **Specific monitoring of ESBL/AmpC-producing *E. coli***

Gene detected	Origin	N. Of isolates	Country	Methodology
<i>bla</i> _{NDM-5}	Bovine meat	2	HU	MIC
<i>bla</i> _{NDM-5}	Pig	1	HU	MIC

- **Specific monitoring of carbapenemase-producing *E. coli* (selective media for CP-producers)**

Gene detected	Origin	N. Of isolates	Country	Methodology
<i>bla</i> _{OXA-48}	Fattening pigs	2	ES	MIC
<i>bla</i> _{OXA-48}	Fattening pigs	1	IT	WGS
<i>bla</i> _{OXA-181}	Fattening pigs	20	IT	WGS
<i>bla</i> _{OXA-181}	Bovine animals	4	IT	WGS
<i>bla</i> _{NDM-5}	Bovine animals	1	IT	WGS
<i>bla</i> _{NDM-5}	Fattening pigs	3	CZ	WGS





Online Visualisation tools



Online Visualisation tools: Story maps

AMR monitoring

 STORY MAP



[Monitoring antimicrobial resistance \(arctis.com\)](#)

AMR in indicator *E.coli*

 STORY MAP



[Monitoring AMR in *Escherichia coli* \(arctis.com\)](#)



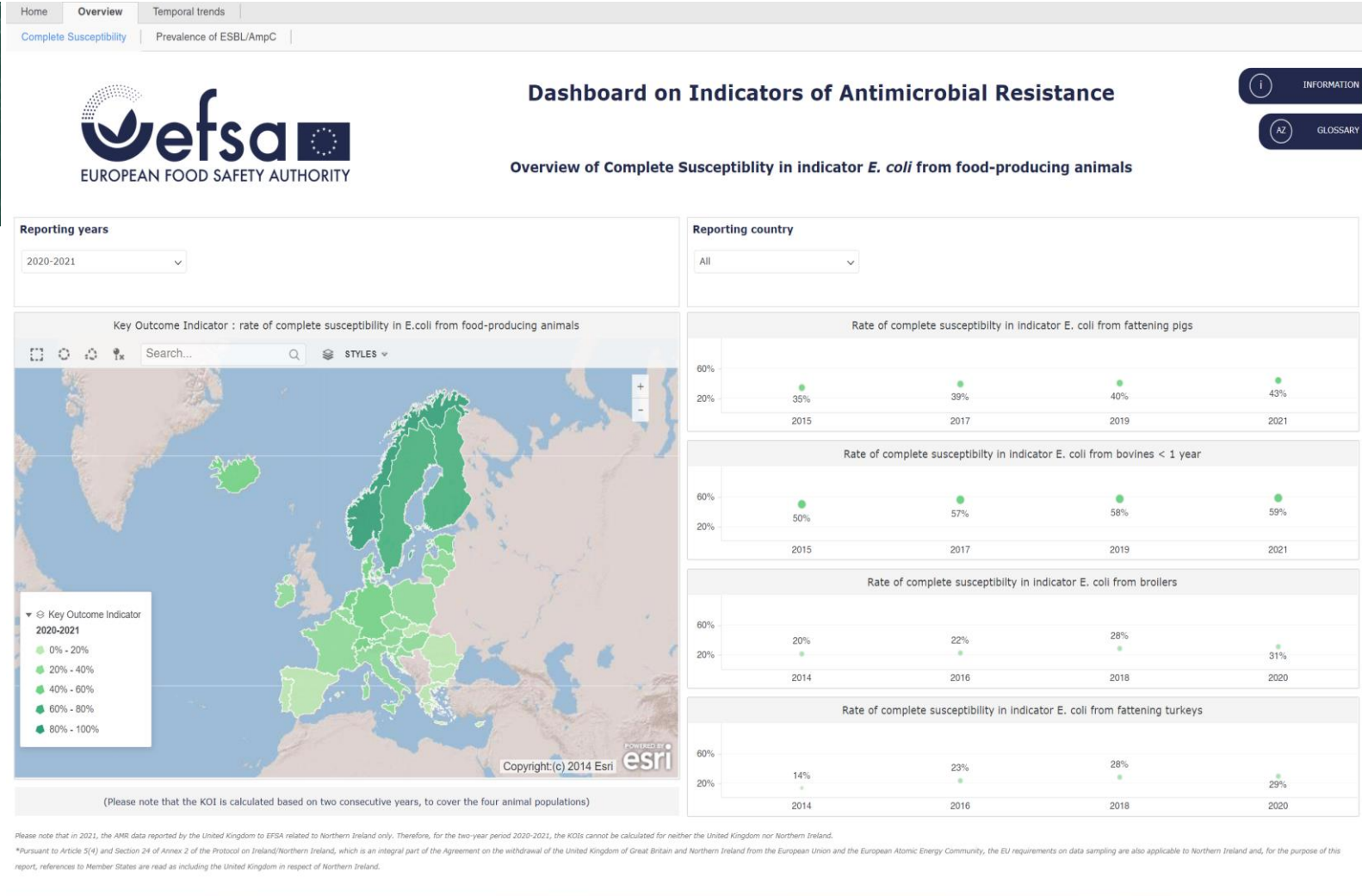
Online Visualisation tools: Dashboards

AMR key indicators DASHBOARD

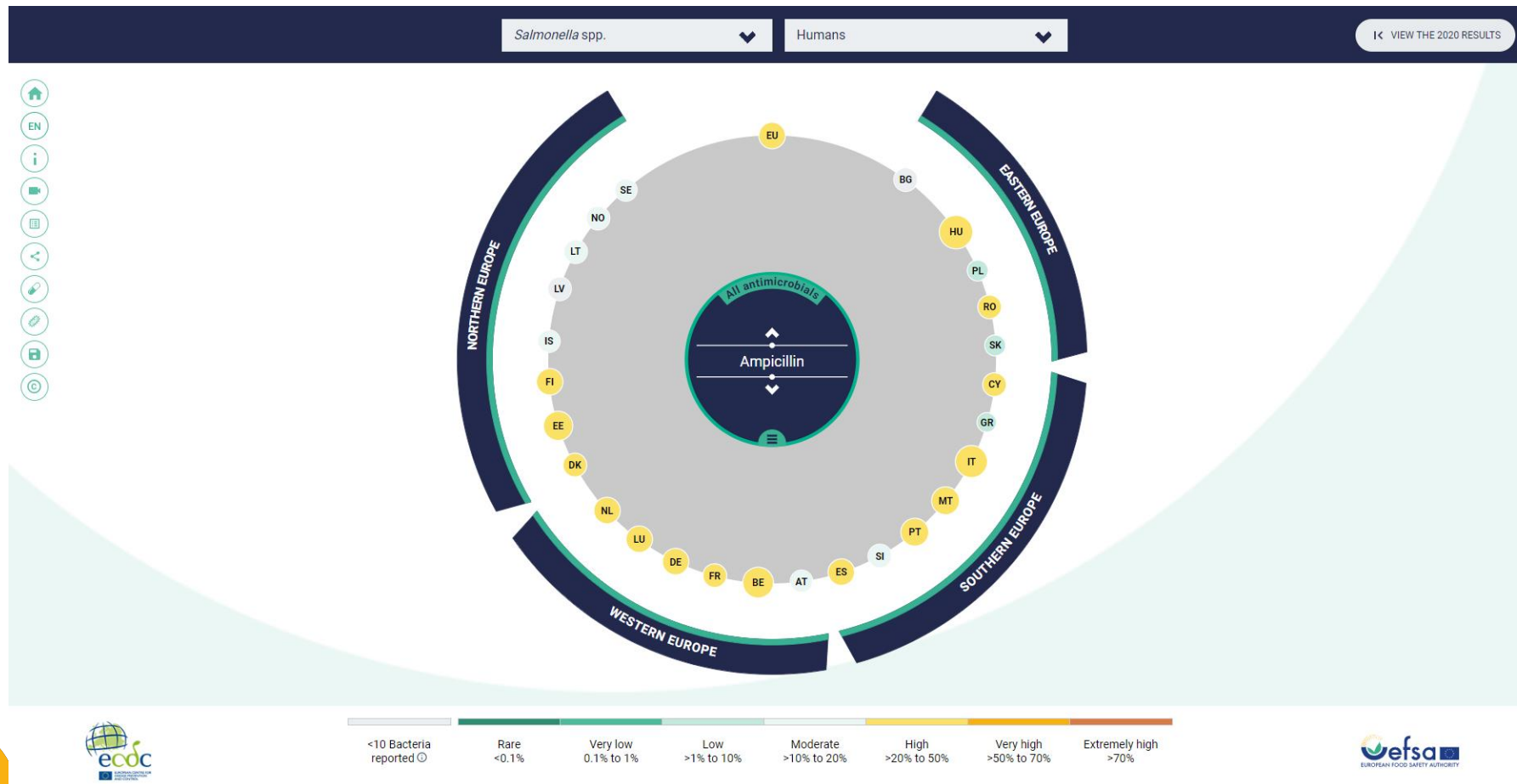


Dashboard on Indicators of Antimicrobial Resistance | EFSA (europa.eu)

- KOI_{CS}
- KOI_{ESBL}
- Prevalence of ESBL- AMPC-producing *E.coli* from food



Online Visualisation tools: DataViz



Antimicrobial resistance in Europe (europa.eu)

Show **levels of the resistance** of *Salmonella* spp., *E. coli* and *Campylobacter* spp. in **food**, **animals** and **humans**, by country in 2020 and 2021.





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