Joint EFSA-ECDC report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food - 2017

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Trusted science for safe food

ecdc EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

efsa European Food Safety Authority

'One Health' Network Meeting, 12 March, Brussels

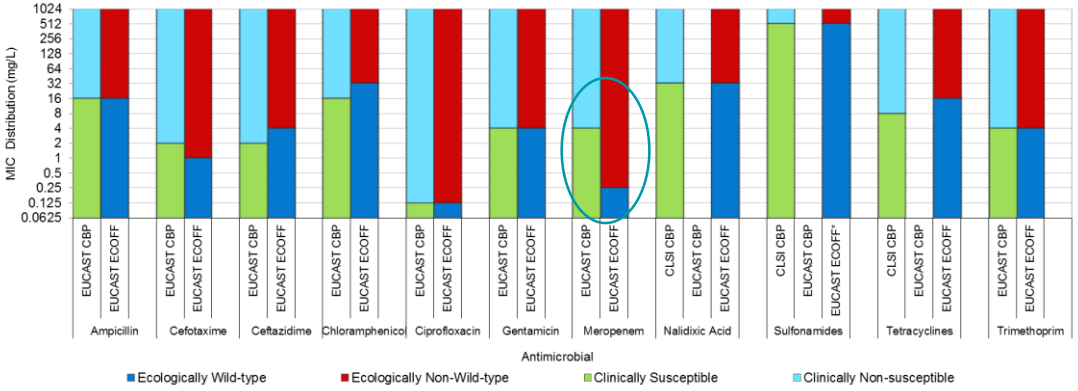
Background *Salmonella* and *Campylobacter* infections in humans

- 93 000 lab-confirmed salmonellosis cases and 250 000 campylobacteriosis cases reported in EU/EEA in 2017
- Mostly mild disease though 39 000 cases hospitalised and 230 died from the disease
- 1 300 cases with bacteremia and 800 urinary-tract infections among salmonellosis cases (no data for campylobacteriosis)
    - These need treatment with antimicrobials!

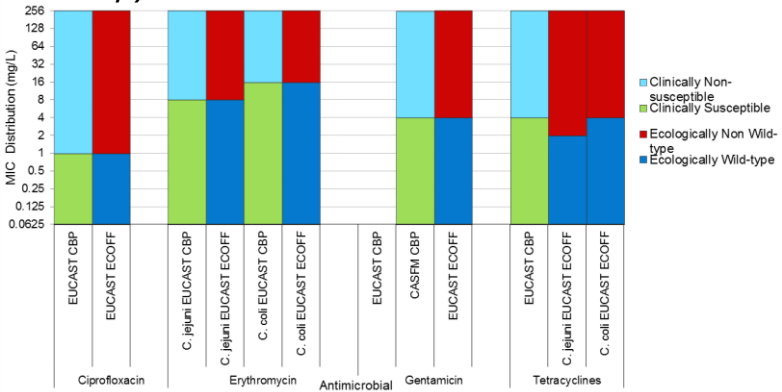
Comparison of criteria EFSA-ECDC

- Quantitative AST results from clinical isolates interpreted with same criteria (epidemiological cut-off values) as animal and food isolates
- When only interpreted results were available, 'resistant' and 'intermediate resistant' results are combined – resulted in good correspondence except for meropenem and *Salmonella*

Salmonella



Campylobacter



Salmonella spp.

Results *Salmonella* from humans

- Human data represents all types of exposure, except known travel which is excluded
- Some countries focus antimicrobial susceptibility testing on specific serovars
- To compare data by country, better separate by serovar but data limitations

Antimicrobial resistance (percent) in *Salmonella* isolates from human cases

Serotype	Tested (N)	Gentamicin	Chloramphenicol	Ampicillin	Cefotaxime	Ceftazidime	Meropenem	Tigecycline	Nalidixic acid	Ciprofloxacin	Azithromycin	Colistin	Sulfamethoxazole	Trimethoprim	Co_trimoxazole	Tetracycline
Salmonella spp (24 MSs)	2,874-15,789	2.2	8.5	27.5	1.9	1.1	0	0.8	12.1	13.0	2.5	4.7	32.8	7.6	5.3	30.2
S. Typhimurium (24 MSs)	478-2,605	1.7	22.3	53.3	2.6	1.0	0	1.7	6.7	8.0	1.1	0.4	48.1	9.3	6.3	44.5
Monophasic *S*. Typhimurium (14 MSs)	79-1,812	2.7	10.8	86.8	2.2	0.8	0	0.9	3.7	6.0	1.9	1.2	86.7	15.9	8.9	87.9
S. Derby (17 MSs)	43-155	0.7	6.2	15.5	3.4	1.4	0	0	1.1	2.0	0	0	30.0	10.4	9.3	26.2
S. Enteritidis (23 MSs)	631-5,896	0.5	1.5	6.8	0.7	0.1	0	0.3	15.3	13.3	1.3	15.2	6.3	1.2	2.0	3.9
S. Infantis (21 MSs)	83-496	1.6	5.3	12.3	5.4	2.9	0	1.0	41.2	39.6	1.7	0	43.0	14.2	16.8	40.1
S. Kentucky (13 MSs)	21-158	58.3	13.8	82.3	25.2	22.3	0	5.1	91.7	87.9	6.2	2.5	77.4	8.6	4.8	78.4

More commonly associated with pigs and cattle

Mainly poultry-associated (eggs, broilers, turkeys)

Data Overview on *Salmonella* spp.

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Fattening Pigs

Carcasses

22 MSs + 1 non-MS

954 isolates

8 MSs with <10 isolates

Caecal samples

7 MSs

310 isolates

5 MSs with >10 isolates

Veal Calves

Carcasses

7 MSs

82 isolates

2 MSs with >10 isolates

Caecal samples

6 MSs +1 non-MSs

94 isolates

3 MSs with <10 isolates

Numbers of isolates varied importantly between countries!

Resistance to AMP, SUL and TET in *Salmonella* spp.

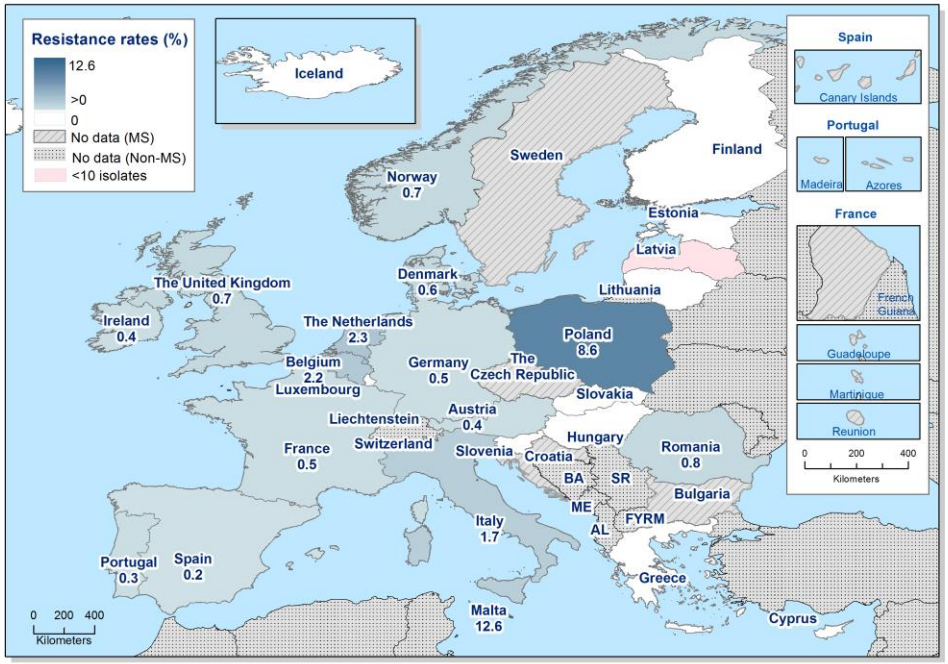
- High levels of resistance to SUL and TET, and in a lesser extent, to AMP in *Salmonella* spp. from pigs
- Typically, levels of resistance were lower in *Salmonella* spp. from calves compared with those from pigs

  Source of variations related to the number of isolates tested

Combined resistance to critical antimicrobials in *Salmonella* from humans

- Combined 'microbiological' and clinical resistance in 0.9% and 0.6% of human *Salmonella* infections in the EU
- Highest in Malta (12.6%) and Poland (8.6%)

Combined 'microbiological' resistance to ciprofloxacin and cefotaxime among *Salmonella* spp. from human cases in 2017



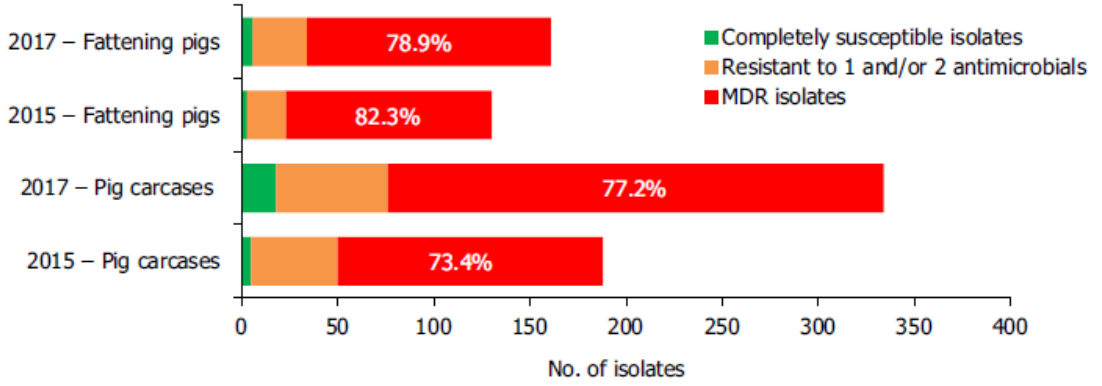
Combined resistance to CIP/CTX in *Salmonella* spp. from pig carcases

- … detected in only one MS at low level (1.1%) – 'microbiological resistance'

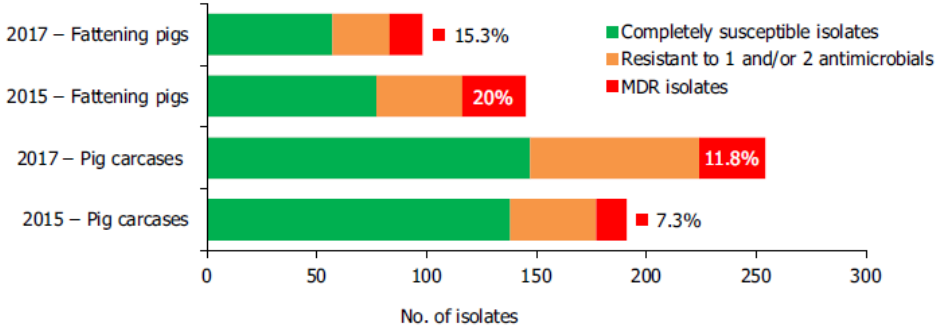
MDR levels in *Salmonella* spp.

- Considerably higher in *Salmonella* spp. from pig carcases than calf carcases
- … partly reflect the relative contribution of particular serovars and their associated resistance within these animal categories

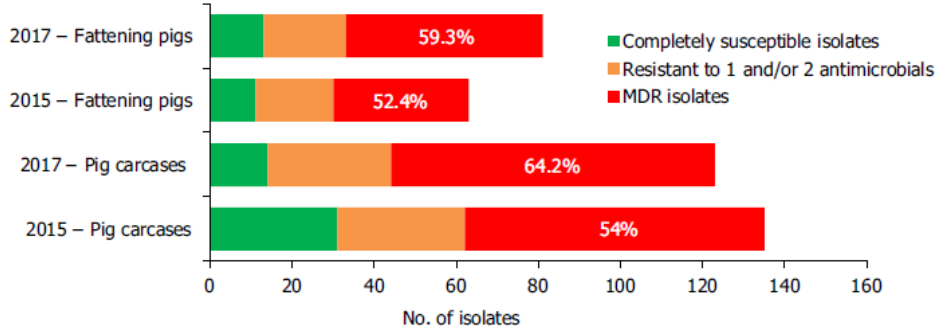
Salmonella spp.



S. Derby

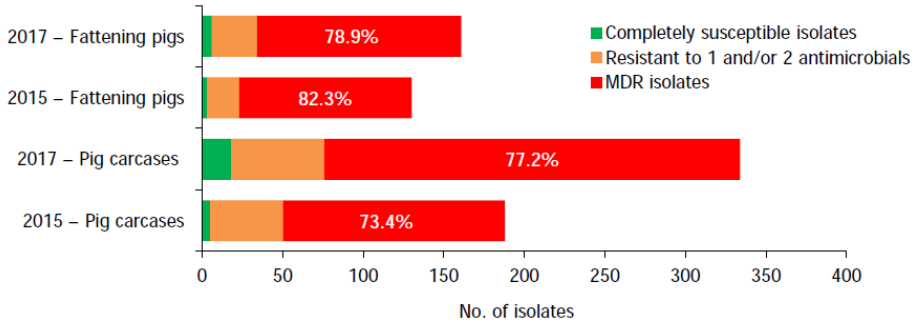


S. Typhimurium

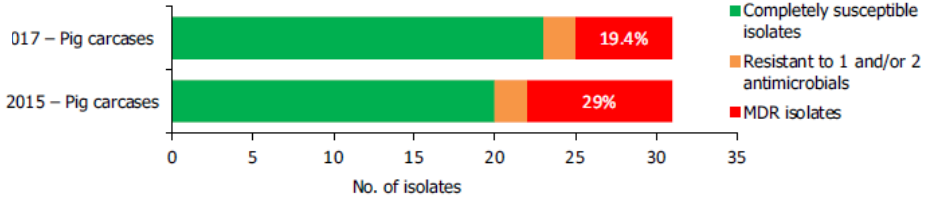


MDR levels in *Salmonella* spp.

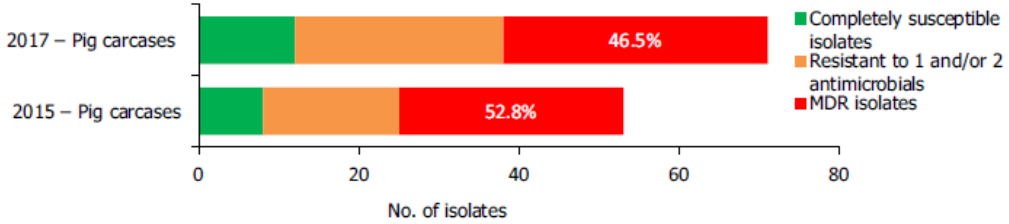
Monophasic *S.* Typhimurium



S. Infantis



S. Rissen



Campylobacter spp.

Results *Campylobacter* from humans

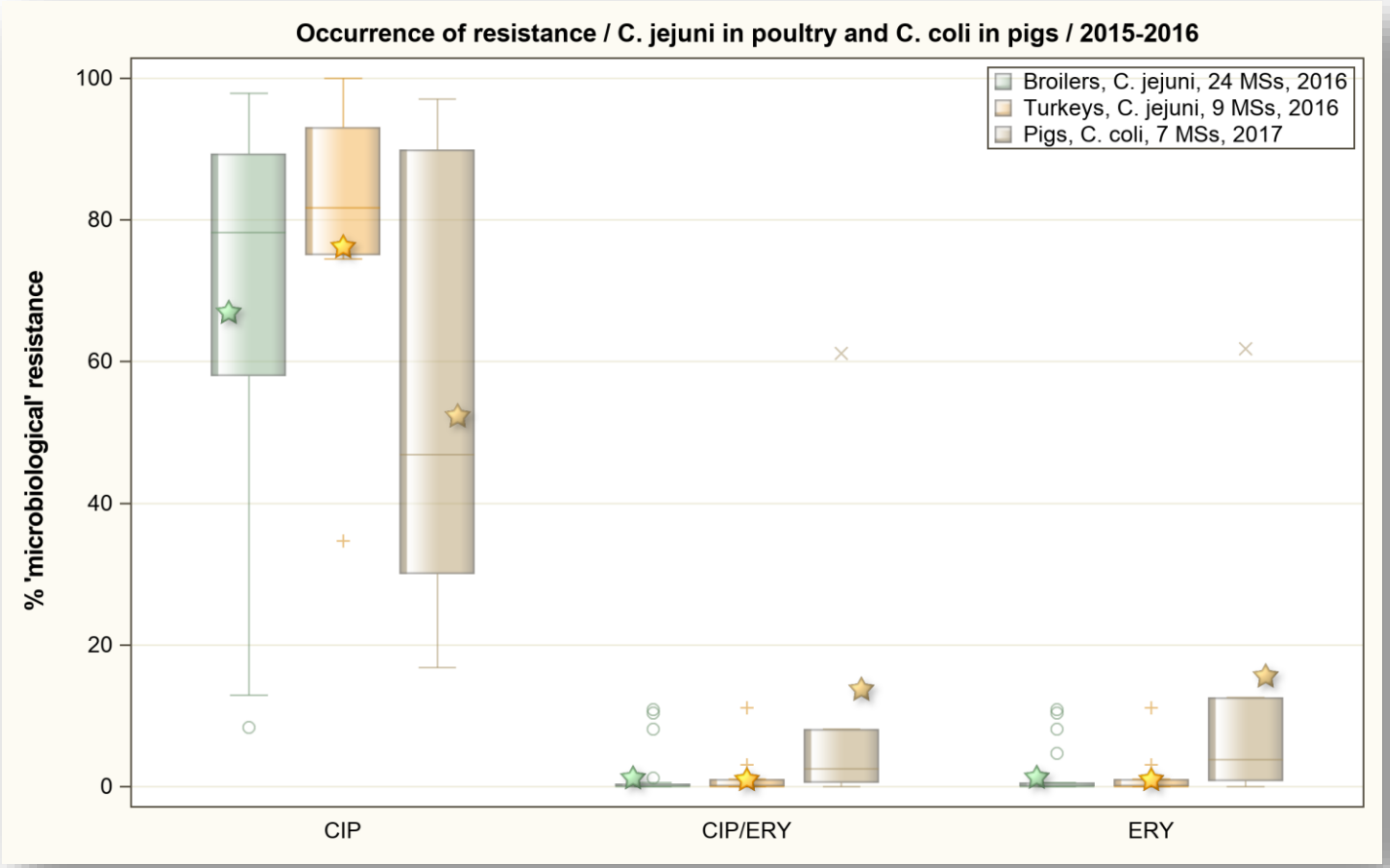
- Human data represents all types of exposure, except known travel which is excluded

Antimicrobial resistance (percent) in *Campylobacter* isolates from human cases

Species	Tested (N)	Gentamicin	Co-amoxiclav	Ciprofloxacin	Erythromycin	Tetracyclines
C. jejuni (19 MSs)	1,055-23,714	0.5	2.7	57.7	2.0	45.4
C. coli (18 MSs)	1,043-2,776	1.8	3.7	63.5	12.8	68.3

Overview: *C. jejuni* in poultry and *C. coli* in pigs

- *C. coli* in pigs
- Important resistance to fluoroquino-lones (CIP)
- Low resistance to Macrolides (ERY)
- Low combined resistance to CIAs in pigs: there are outliers!

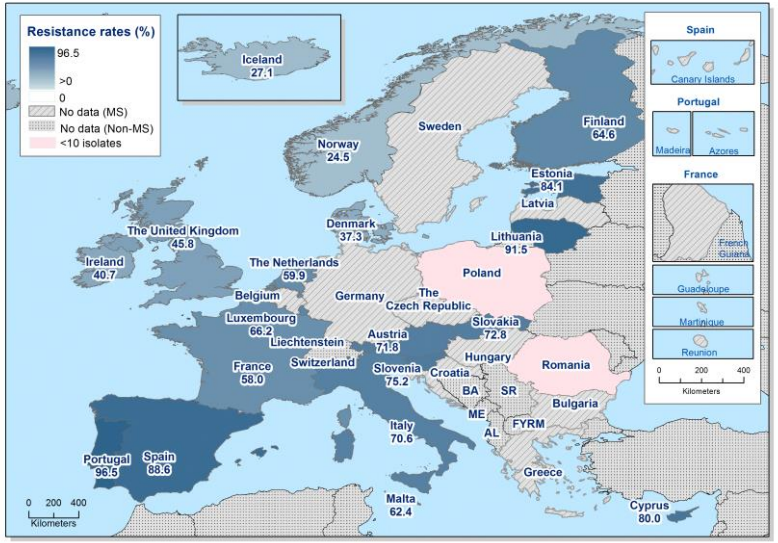


Ciprofloxacin resistance in *Campylobacter* from humans

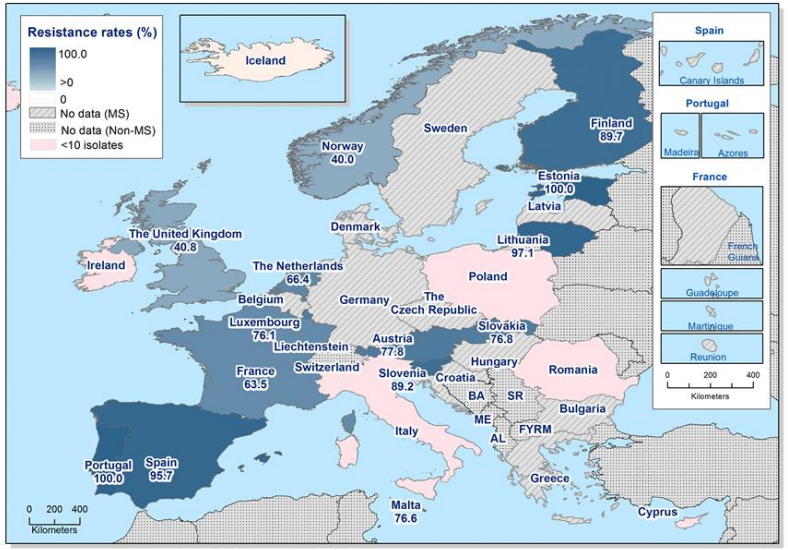
- Very high to extremely high (58-97%) resistance in *C. jejuni* except in countries in northern/north-western Europe
- Even higher in *C. coli* where 13/18 MSs observed extremely high levels (70–100%) of ciprofloxacin resistance

→ Fluoroquinolones can no longer be considered appropriate for routine empirical treatment of *Campylobacter* infections

C. jejuni

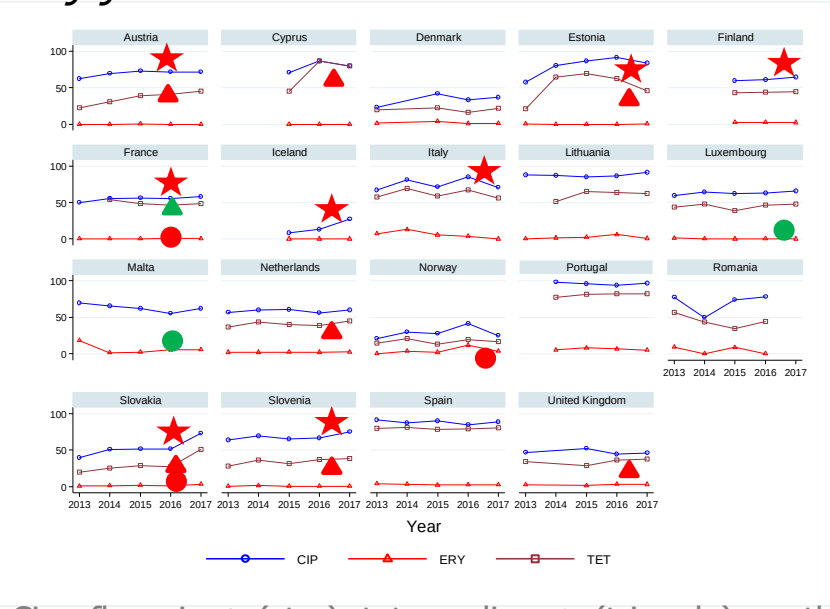


C. coli

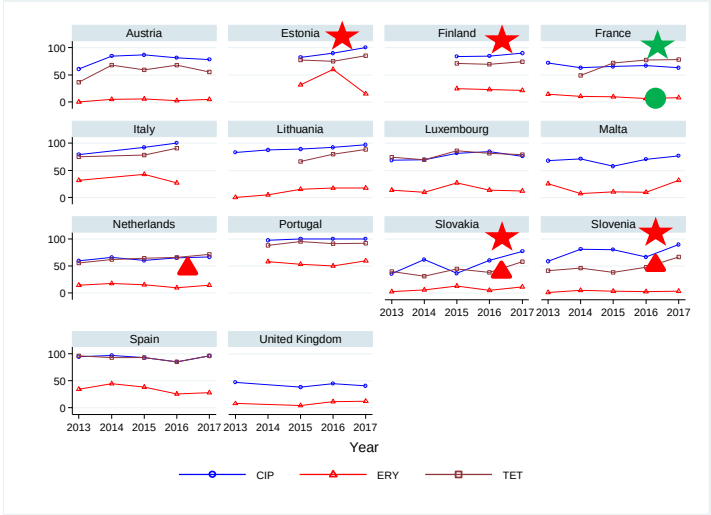


Trends in resistance 2013-2017

C. jejuni



C. coli

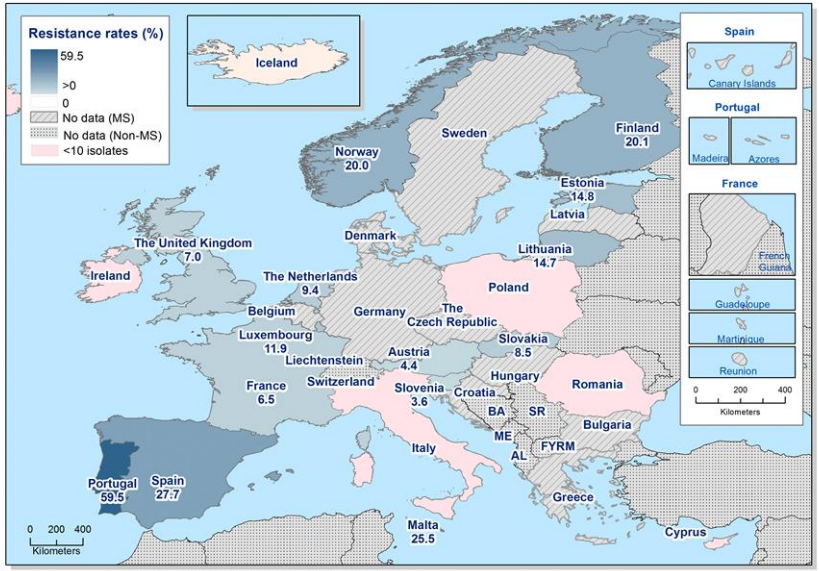


Ciprofloxacin ★ (star), tetracycline ▲ (triangle), erythromycin ● (circle)
Statistically significant increase in red and decrease in green

Combined resistance to critical antimicrobials in *Campylobacter* from humans

- Combined resistance on average 1.2% in *C.jejuni* and 10.2% in *C. coli*
- A few countries report high to very high combined resistance in *C. coli* (20.1-59.5%)
- If applying these results on all reported campylobacter infections in the EU in 2017, more than 5 000 infections would be difficult to treat

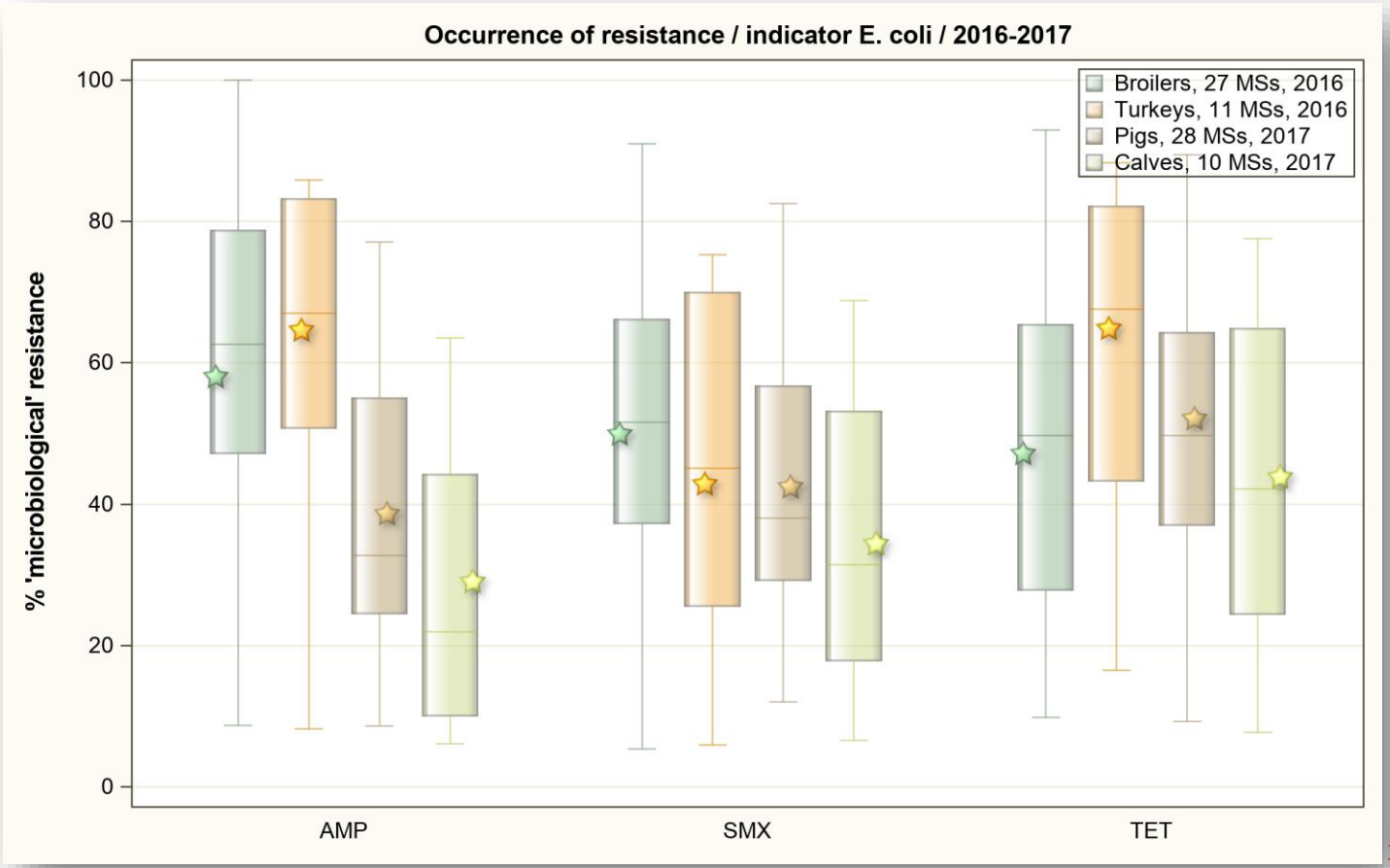
Combined resistance to ciprofloxacin and erythromycin in *Campylobacter coli* from human cases in 2017



Indicator *E. coli*

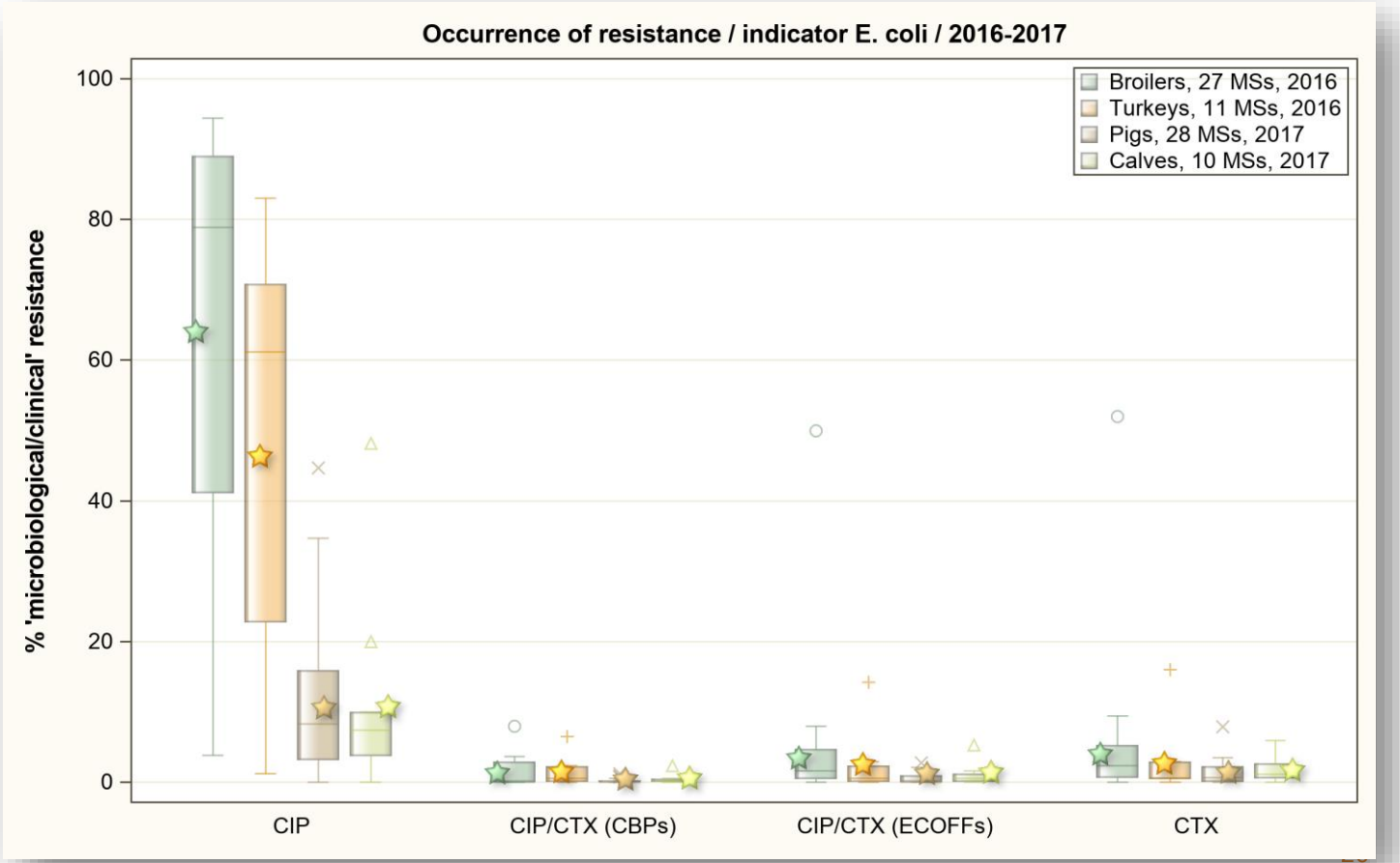
Overview: AMR in indicator *E. coli* in 2017

- From Fattening Pigs and Calves in 2017
- [For the record, in poultry in 2016]
- High levels of resistance in commonly used antimicrobials
- Important variability between reporting countries!



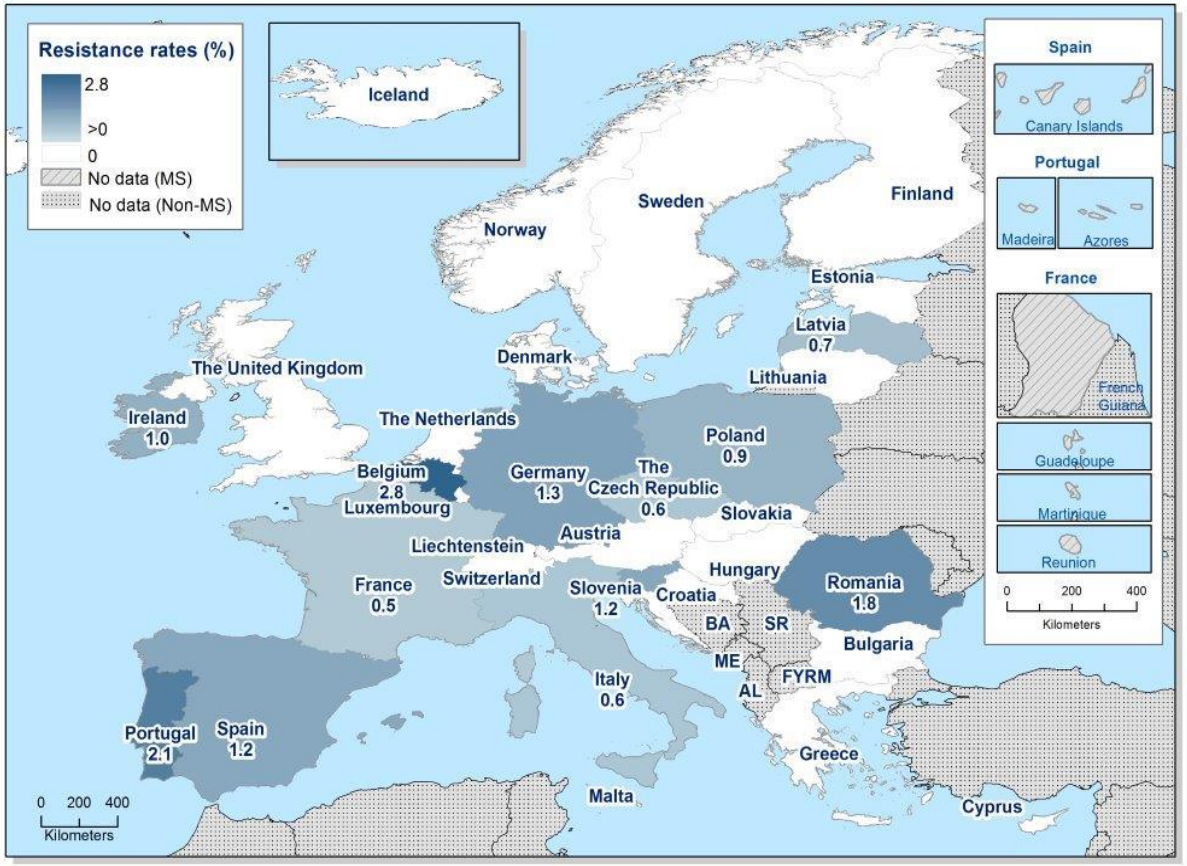
Overview: AMR to CIAs in indicator *E. coli*

- Important resistance to fluoroquinolones (CIP) in Broilers and Turkeys
- Very low resistance to C3G (CTX)
- Very low combined resistance to CIAs: There are outliers!

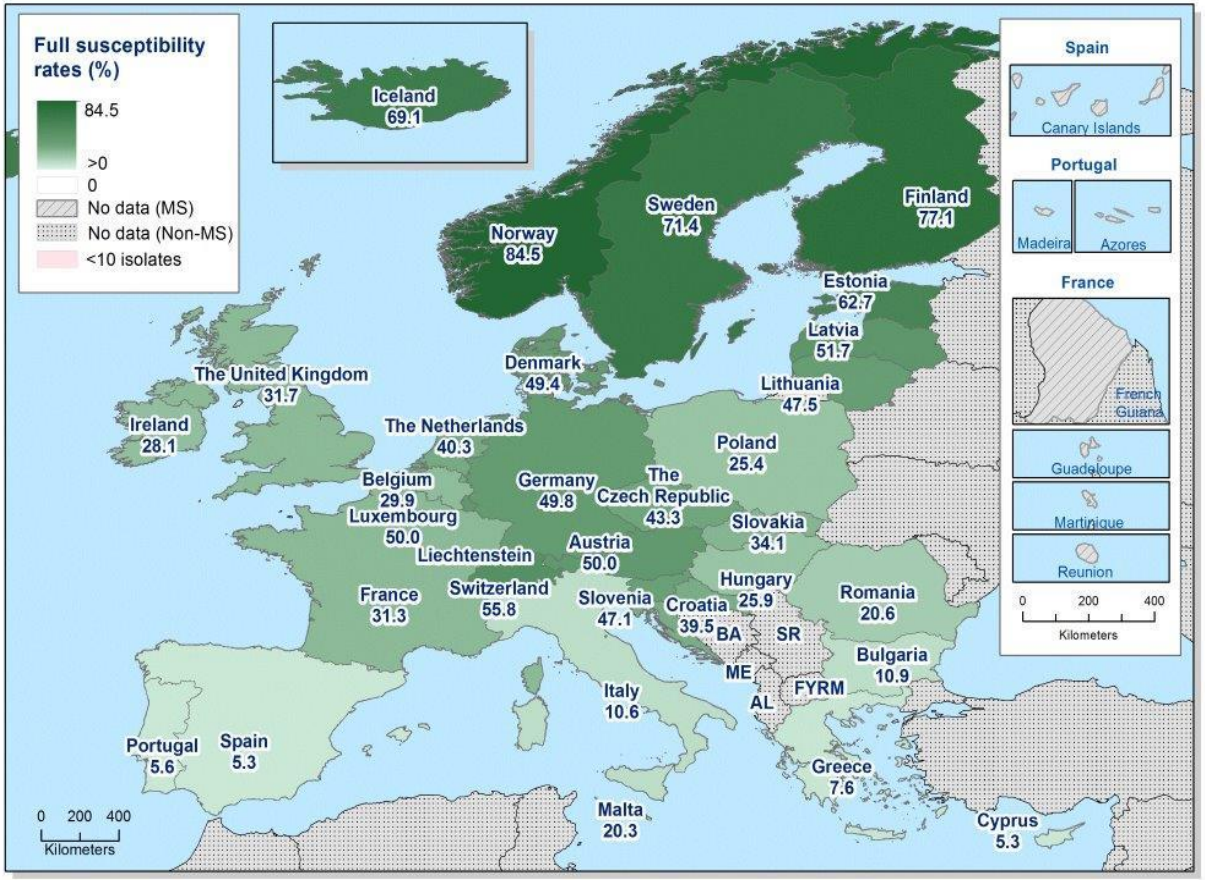


Combined Resistance to CIP/CTX in *E. coli* from Fattening Pigs

- Low levels of combined resistance to **CIP/CTX** (ECOFFs)
- 'Clinical' combined resistance detected in 8 isolates in 7 MSs



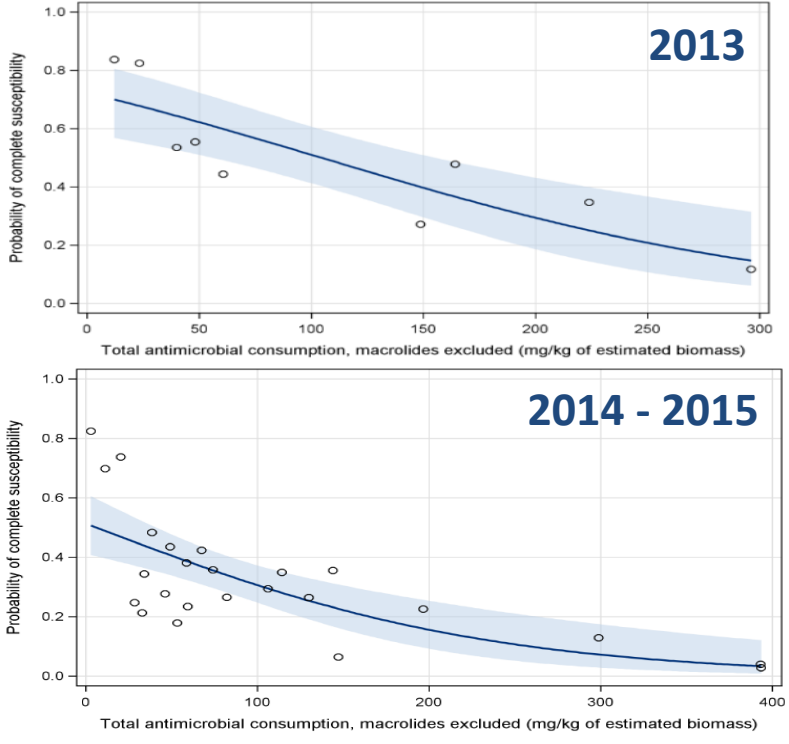
‘Complete susceptibility’ in indicator *E. coli* from pigs (2017)



- ‘Complete susceptibility’:
  susceptibility to all the antimicrobial classes tested of the harmonised panel tested
- North-South gradient
- Extended to:
  Broilers,
  Turkeys and
  Calves

OVERALL LINK AMC - COMPLETE SUSCEPTIBILITY

INDICATOR *E. COLI* – FOOD-PRODUCING ANIMALS



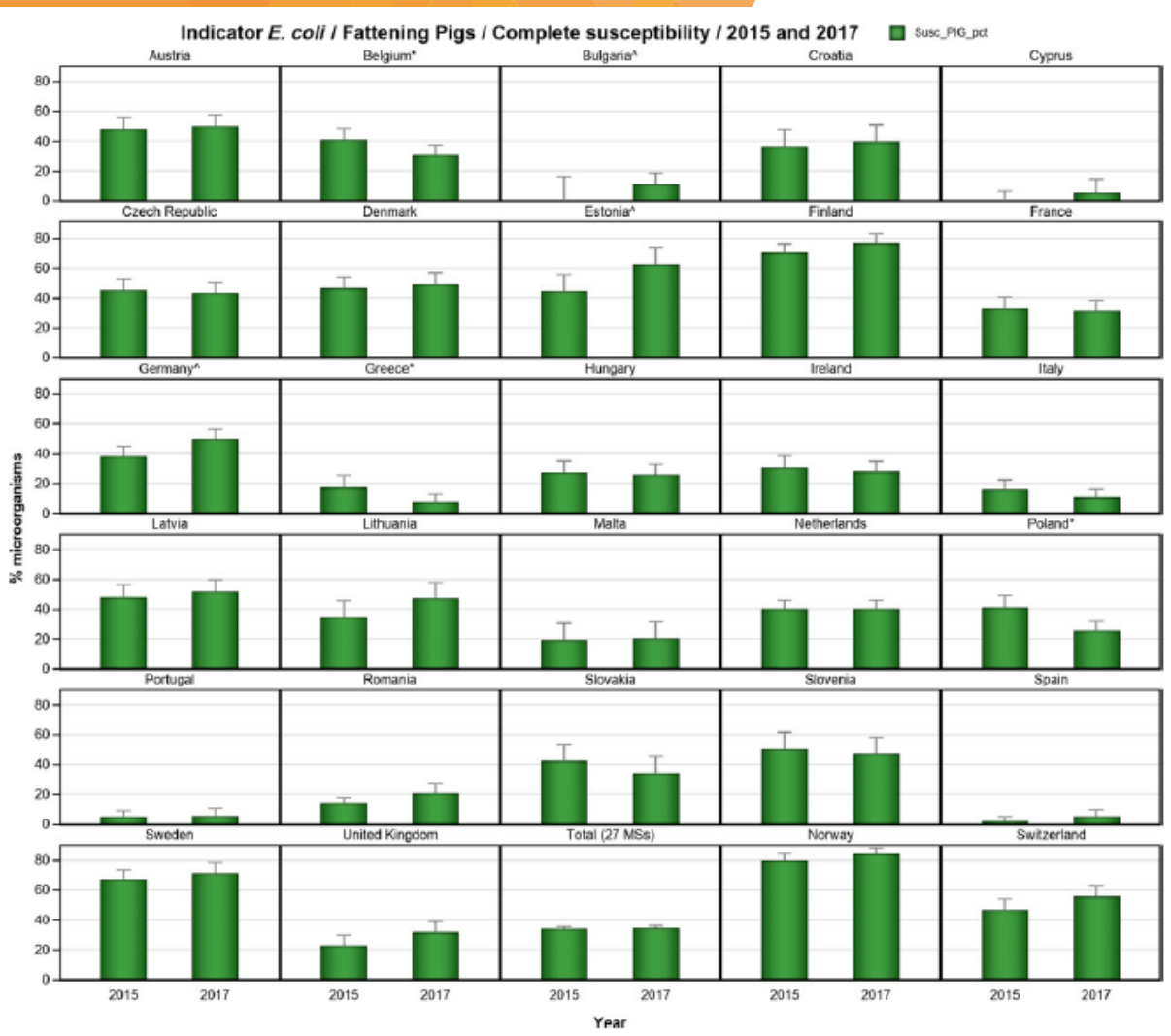
- Statistically-significant negative association between total AMC and complete susceptibility in food-producing animals

» Prudent use should concern all antimicrobial classes consumed

» Complete susceptibility: a potential candidate for an epidemiological indicator (wide ranges in AMC and CS)

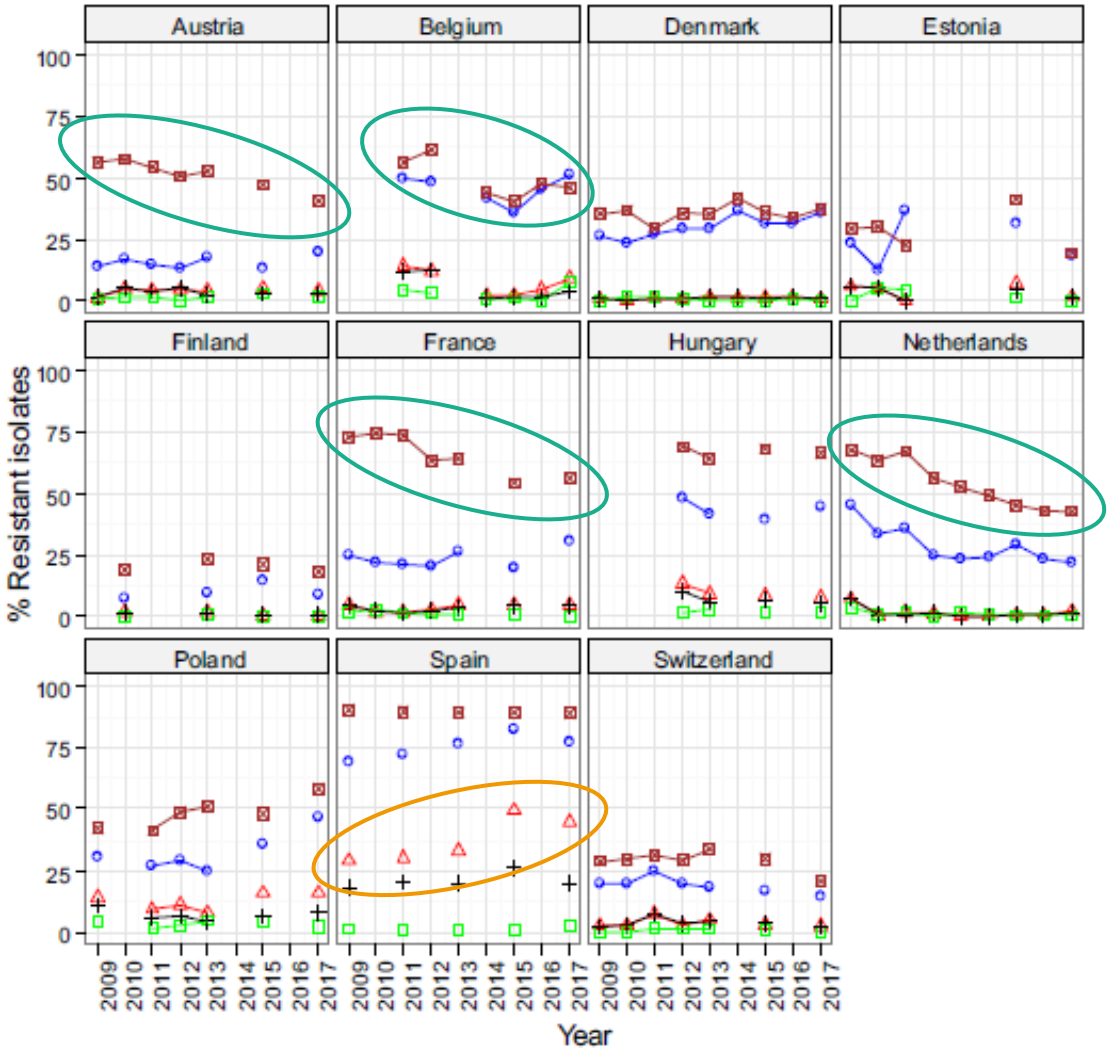
Complete Susceptibility in *E. coli* from pigs

- Changes in occurrence of 'complete susceptibility' in indicator *E. coli* from fattening pigs – 2015 - 2017



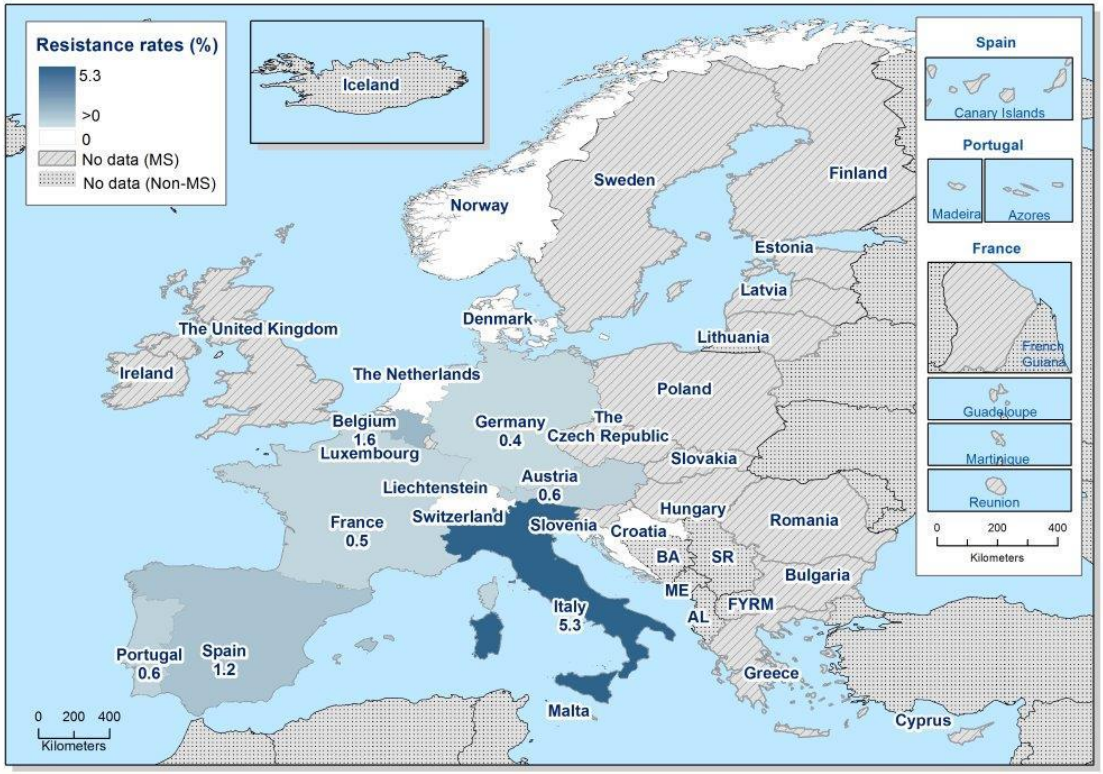
Trends in AMR in indicator *E. coli* from Fattening Pigs

- Decreasing trends
- Increasing trends
- Futher information in National Reports



Combined Resistance to CIP/CTX in *E. coli* from Veal Calves

- Low to very low levels of combined resistance or even non-combined resistance observed



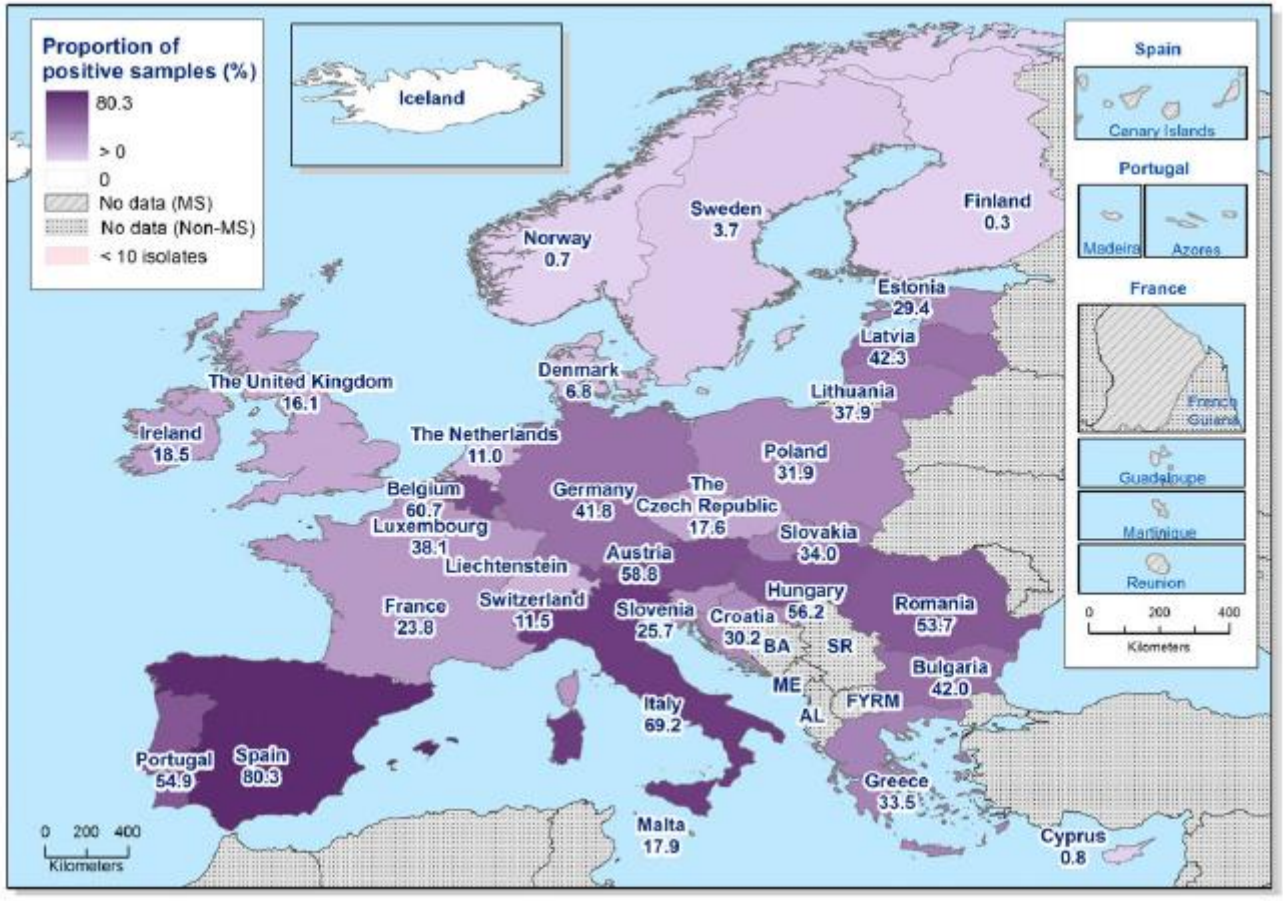
Specific monitorings

Specific monitoring of … ESBL-/AmpC-producing *E. coli* - 2017

- Prevalence (in %)

2017	ESBL or AmpC	ESBL	AmpC	ESBL + AmpC
Pig Meat (28 MSs)	6	4.7	1.6	0.3
Bovine Meat (28 MSs)	4.8	3.9	1.1	0.1
Fattening Pigs (28 MSs)	43.8	34.3	11.1	1.6
Cattle,<1 y. old (10 MSs)	44.5	41.5	6.0	3.0

ESBL Prevalence in Fattening Pigs (2017)



ESBL Prevalence in Pork and Beef (2017)

efsa
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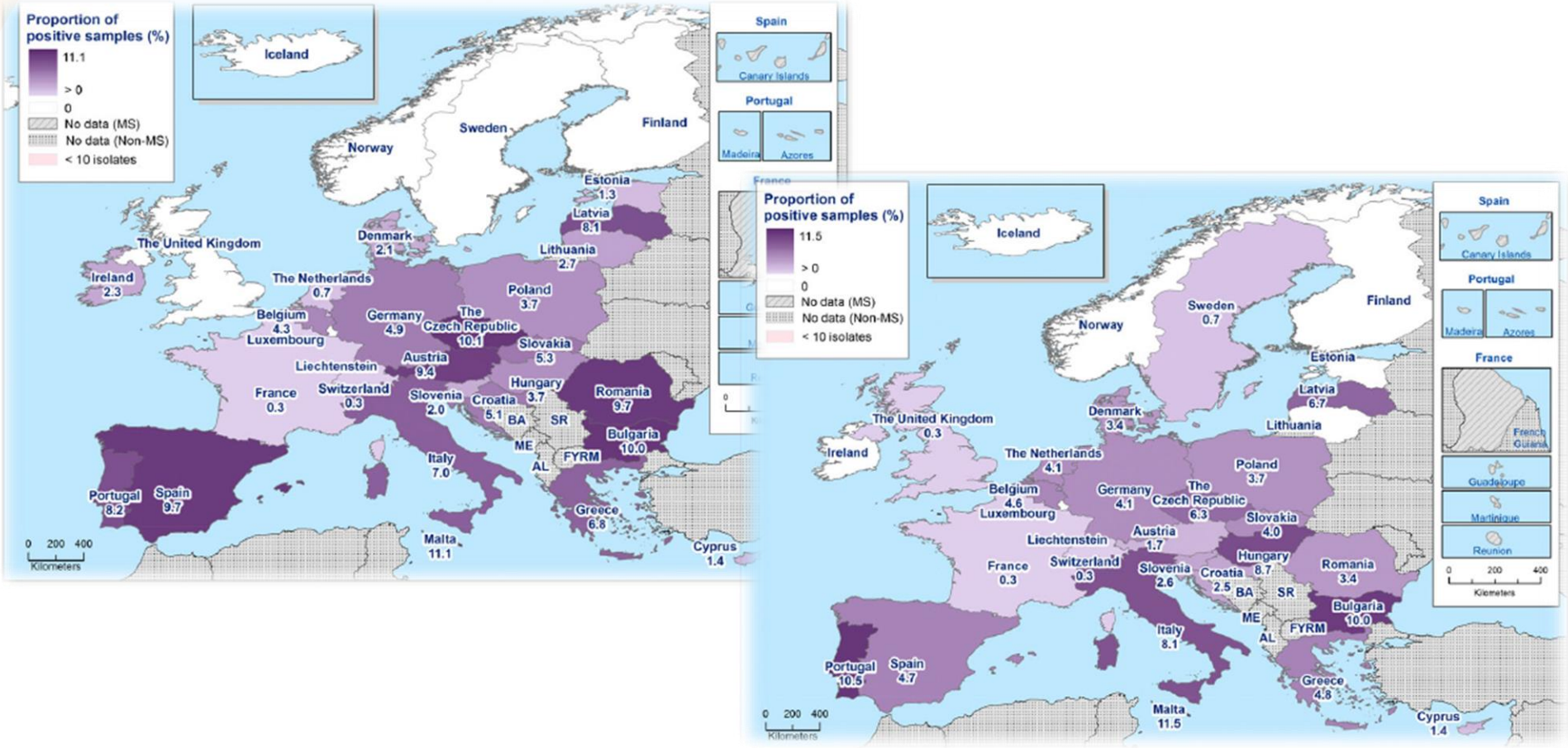
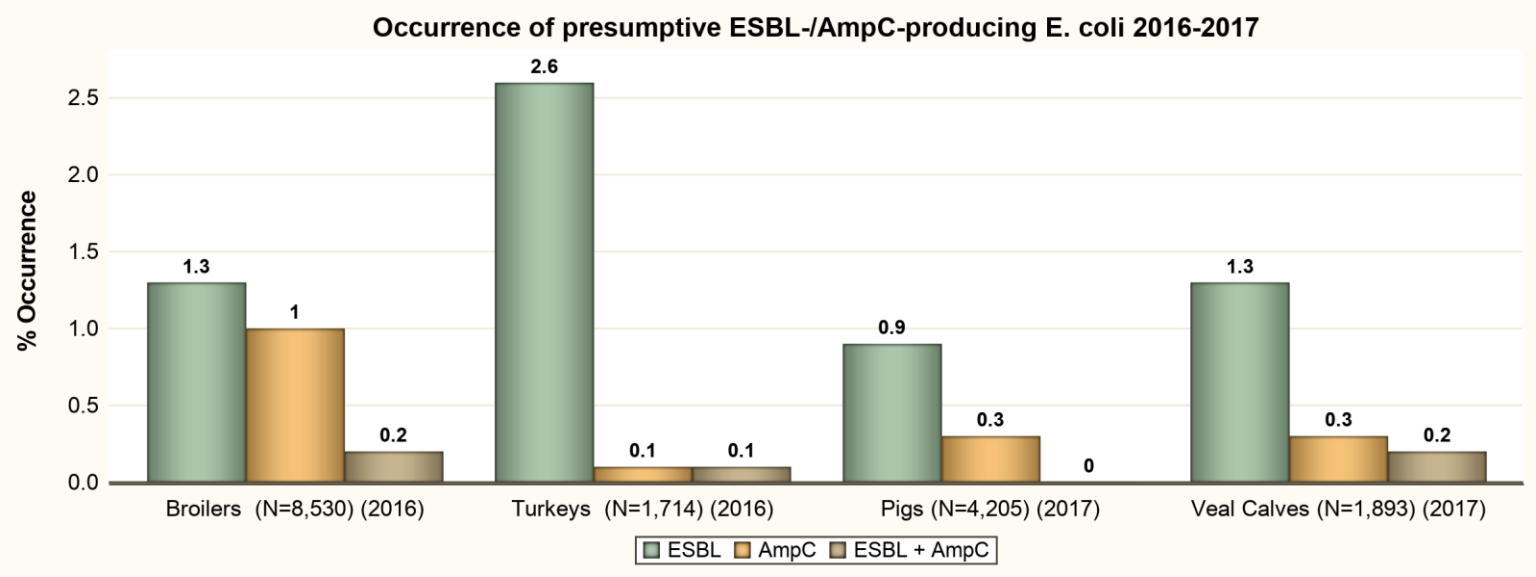


3rd-generation Cephalosporin Resistance

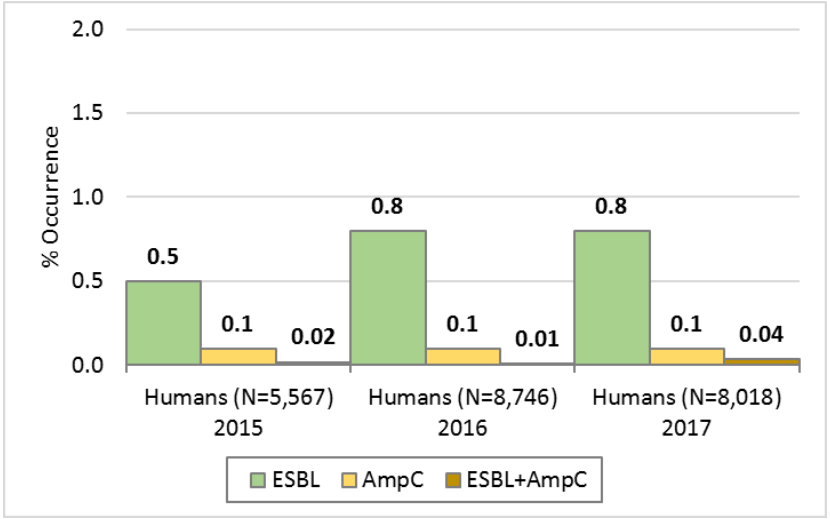
- Presumptive ESBL-/AmpC-producing *E. coli* 2016 - 2017



ESBL- and AmpC-producing *Salmonella* in humans

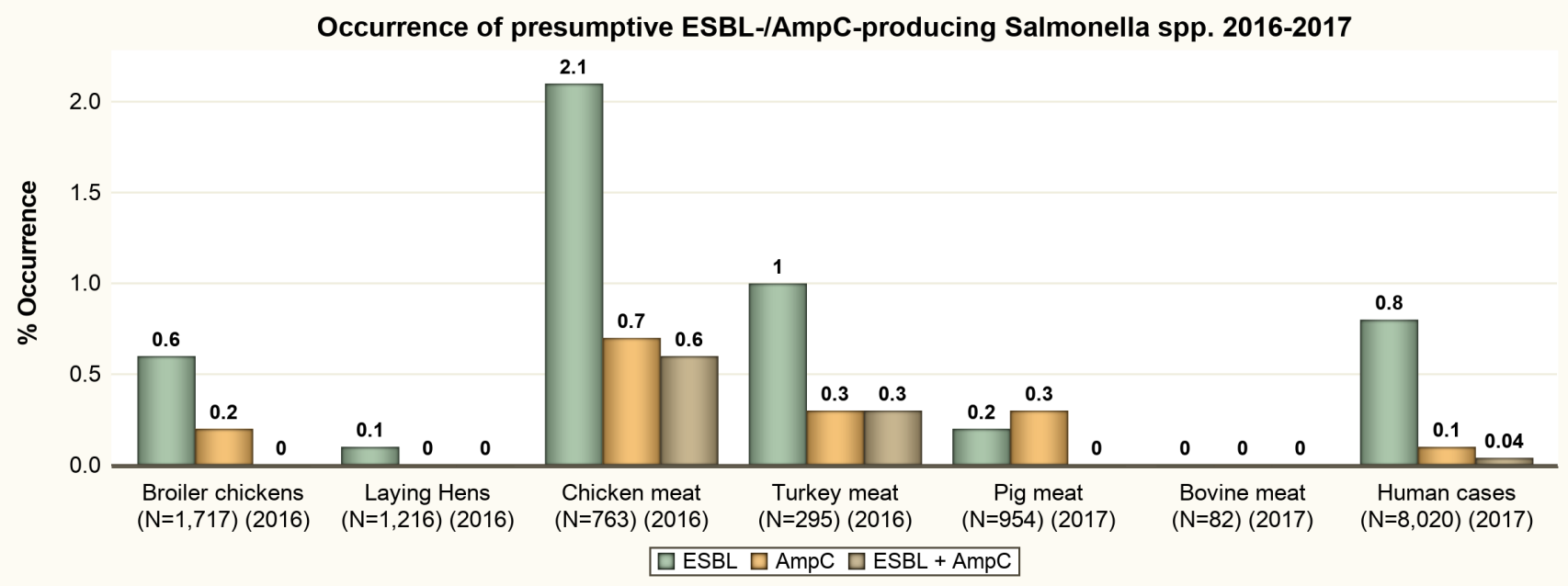
- Of 138 ESBL isolates in 2017:
  - *S*. Typhimurium 37
  - monophasic *S*. Typhimurium 34
  - *S*. Kentucky 32
  - 10 other serovars 35
- Most *Salmonella* with ESBL also resistant to tetracyclines, co-trimoxazole and often also fluoroquinolones. If applying these results on all reported *Salmonella* infections in the EU in 2017, more than 700 infections would be very difficult to treat

Occurrence of ESBL, AmpC and in *Salmonella* from humans, 2015-2017



3rd-generation Cephalosporin Resistance

- Presumptive ESBL-/AmpC-producing *Salmonella* 2016 - 2017



Resistance to carbapenems: 2015 - 2017

- Specific monitoring of carbapenemase-producing *E. coli*
  - Meat from pigs: 17 MSs – 4,544 samples
  - Fattening pigs: 18 MSs – 4,914 samples
  - Meat from bovines: 17 MSs - 4,315 samples
  - Calves, < 1 y. old: 8 MSs – 2,523 samples

No positive results detected

- Monitoring in the pig sector in 2015
  - **2** carbapenemase-producing *E. coli* detected in **2 MSs**
- Monitoring in the pig sector in 2017
  - **1** carbapenemase-producing *E. coli* detected in **1 MS**

MRSA: voluntary monitoring

Overview on MRSA

- The findings have underlined the requirement for continued monitoring and appropriate molecular characterisation of MRSA isolates.
  - **Increase** in the occurrence of **MRSA in fattening pigs** (2009-2015: CH, 2010-2017: FI)
- Detection of LA-MRSA, HA-MRSA and CA-MRSA from companion animals, and the isolation of **linezolid-resistant strains** harbouring the ***cfr* gene** from pigs highlight that the situation is constantly evolving.
- The need for further molecular characterisation is highlighted by the occurrence of **mosaic strains**.
- The presence or absence of certain virulence or other factors which tend to be associated with certain MRSA lineages is also assuming great importance when assessing the significance of MRSA isolates.
- Monitoring is currently voluntary and although it provides a considerable amount of useful information, the **picture** obtained is **incomplete**.

ACKNOWLEDGEMENTS

- The FWD Network
- All CAs, NRL-AR and laboratories involved
- EURL-AR

Thank you for your attention!