

LEGISLATION AND MONITORING OF ANTIMICROBIAL RESISTANCE IN BEEF AND MILK

Ivona Kožárová, Ivana Regecová, Jana Výrostková, Aleš Pavlík, Marlana Zielińska-Górska

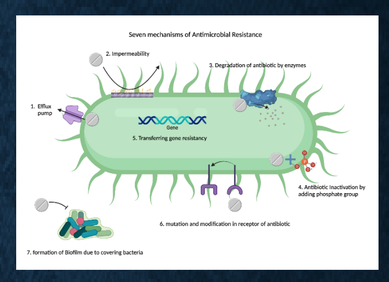
Visegrad Fund

The prudent use of antimicrobials in veterinary medicine is a cornerstone of addressing antimicrobial resistance. Antimicrobial resistance threatens the effective treatment of an ever-growing range of infections caused by microorganisms. A harmonised effective monitoring and reporting system on the prevalence of resistant microorganisms in food-producing animals and food is essential. This work presents an overview of the legislation, policies and strategies in the European Union on antimicrobial resistance, as well as data from the monitoring of the occurrence of antimicrobial resistance in zoonotic and indicator bacteria from bovine animals and in their products in 2023–2024 in the European Union. The data were taken from the European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2023–2024 published by the European Food Safety Authority and the European Centre for Disease Prevention and Control on February 18, 2026.

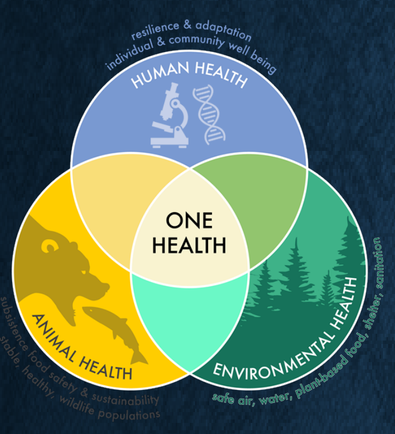


Antimicrobial resistance to human and veterinary medicines is a growing health problem worldwide. Tackling the threat of AMR is a high priority today and requires close cooperation between the human and veterinary sectors, based on the One Health concept.

Antimicrobial resistance (AMR) means the ability of micro-organisms to survive or to grow in the presence of a concentration of an antimicrobial agent which is usually sufficient to inhibit or kill micro-organisms of the same species.



Since the recognition of AMR as a critical health issue, the EU has approved a series of strategic interventions, legislative reforms, and collaborative efforts.



The European Medicines Agency (EMA) | European Food Safety Authority (EFSA) | World Health Organization (WHO) | World Organisation for Animal Health (WOAH) | Food and Agriculture Organization (FAO)



EMA's One Health approach → LEGAL FRAMEWORK

- Regulation (EU) 2019/6
- Directive 2003/99/EC
- Commission Implementing Decision (EU) 2020/1729
- Union Summary Report on Antimicrobial Resistance

REPORTING ON AMR IN BEEF AND MILK

The latest EU summary report on AMR was published by the EFSA and ECDC authorities on February 18, 2026. In the period of 2023–2024, the occurrence of resistance to selected antimicrobials and combined resistance in zoonotic and indicator bacteria isolates from bovine animals (cattle under 1 year, dairy cows) and beef (bovine meat) was as follows:

MANDATORY



BEEF COWS

***Salmonella* spp.** isolates

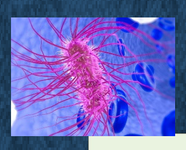
- Resistance of *Salmonella* isolates to ampicillin, tetracyclines and sulfonamides ranged from moderate to very high. Resistance to third-generation cephalosporins (cefotaxime and ceftazidime), azithromycin and tigecycline was reported at low levels, resistance to colistin was moderate, and the combined resistance to ciprofloxacin and cefotaxime, categorised as highest priority critically important antimicrobials by WHO, was also low.
- At the EU Member States level, the proportion of presumptive ESBL- and/or AmpC- producers was very low to low in *Salmonella* spp. isolates from calf animals/carcases.



BEEF COWS

***Campylobacter* isolates**

- In *Campylobacter* isolates resistance to fluoroquinolones (ciprofloxacin) was very high. Overall, the levels of resistance to ciprofloxacin in isolates obtained from all food-producing animals including cattle were higher for *C. coli* than for *C. jejuni*.
- The whole genome sequencing results reported for erythromycin-resistant *C. jejuni* and *C. coli* isolates showed a predominant detection of the mutation A2075G in the 23S rRNA gene in most isolates.
- One *C. coli* isolate from calves was reported positive to the presence of erm(B).
- Overall combined resistance to these antimicrobials was lower in *C. jejuni* isolates. Multidrug resistance (MDR) levels ranged from very low to low in the considered animal species. Compared to *C. jejuni*, MDR was markedly higher in *C. coli* isolates, varying from moderate to high.



BEEF COWS

***Escherichia coli* isolates**

- In *E. coli* isolates median levels of resistance to ampicillin, sulfamethoxazole, trimethoprim and tetracycline ranged from high to very high. Median levels of resistance to cefotaxime and ceftazidime were very low. Resistance to ciprofloxacin and nalidixic acid was registered at high median levels. Resistance to carbapenems (meropenem) was not detected. A statistically significant decreasing trends in resistance were observed for colistin and tetracycline in calves.
- A significant decreasing trends were observed for ESBL-producing *E. coli* in cattle under 1 year and bovine meat. ESBL-producers predominated over AmpC-producers by phenotypic and genotypic results.
- In the specific monitoring of *ESBL-/AmpC-/CP*-producing *E. coli*, two CP-producers were reported from cattle under 1 year (bla_{VIM-1} or bla_{NDM-5}).
- In the specific monitoring of CP-producing *E. coli*, five isolates from calves (four with $bla_{OXA-181}$, one with bla_{OXA-48}) were reported.





Voluntary

MRSA Methicillin-resistant Staphylococcus aureus

E. faecalis *E. faecium*

MILK

- ✓ The most frequently encountered resistant pathogenic strains in dairy farming are *Staphylococcus aureus*, *E. coli*, *Streptococcus uberis*, *L. monocytogenes* and *Salmonella* spp.
- ✓ In *S. aureus* isolates, resistance to methicillin and methicillin and vancomycin was detected.
- ✓ In *E. coli* isolates, the findings indicated AMR with ampicillin and erythromycin, followed by trimethoprim–sulfamethoxazole and ampicillin–sulbactam.
- ✓ A few *E. coli* isolates were identified as ESBL positive, which exhibited multi drug resistance.
- ✓ The majority of *E. coli* isolates recovered from raw milk harboured the β-lactamase bla_{CTX-M} gene and were resistant to three or more antibiotics.
- ✓ Milk and milk product-isolated *L. monocytogenes* exhibit high resistance against sulfamethoxazole, trimethoprim, erythromycin, cefotetan and oxytetracycline.
- ✓ The probable bacterial hosts of multiple highly abundant antibiotic resistance genes (*MacB* and *VanRC*) are *Pseudomonas* psychrophilic bacteria and Serratia spoilage bacteria, rather than conventionally known foodborne pathogens. It is noteworthy that the relative abundance of *Pseudomonas fluorescens* conformed to the Allometricl function with the cold chain transportation duration, the finding that could provide a reference for assessing the freshness and the risk assessment of antibiotic resistance genes of raw milk.

The poster presentation is based on literary sources presented in the paper published in the conference proceedings.

Acknowledgement: The study was conducted as part of the Visegrad Fund project no. 22430046: Control of antimicrobial resistance by the Integrated Farm System within "Farm to Fork" strategy. The project is co-financed by the governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from the International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.