Comunicazione Orale

COLISTIN AND CARBAPENEM-RESISTANT ESCHERICHIA COLI IN FOOD OF ANIMAL ORIGIN: A PHENOTYPIC AND MOLECULAR STUDY

Ikram Soltani[1], Zineb Belbel[1], Martina Rega[2], Mauro Conter[2], Cristina Bacci[2], Silvia Bonardi[2]

[1]Functional and Evolutionary Ecology Laboratory, Faculty of Natural and Life Sciences, University of Chadli Bendjedid El tarf, Algeria; [2]Dep. of Veterinary Science, Unit of Food Safety, University of Parma, Italy.

Introduction. Escherichia coli is widely used as an indicator organism of antimicrobial resistance (AMR) in the food chain. In recent years, resistance to Highest Priority Critically Important Antimicrobials (HPCIAs) to human medicine, as carbapenems and colistin, has been increasingly reported in food-producing animals and foods thereof, suggesting a significant role in the dissemination of AMR bacteria and associated resistance genes. Furthermore, the occurrence of Shiga toxin-producing E. coli (STEC) harboring AMR genes may further increase their potential pathogenicity. In the present study, E. coli strains from foods of animal origin were characterized for their AMR profiles and virulence-associated factors.

Material and Methods. Between 2024 and 2026, 189 food samples (40 chicken carcasses, 20 chicken meat, 31 minced chicken, 4 chicken liver, 16 beef meat, 35 minced beef meat, 26 mixed chicken and beef sausages, 11 raw milk, 6 butter) were collected from poultry slaughterhouses and at retail in Algeria. Samples were enriched in BPW at 37°C for 24h, then plated onto CHROMagar™ Orientation chromogenic medium and incubated at 37°C for 24h. Suspect E. coli pink colonies were identified by API 20E and E. coli strains were tested for AMR. Phenotypic resistance was assessed by the disk diffusion method for β-lactams, third-generation cephalosporins, fluoroquinolones, and carbapenems. Colistin resistance was assessed by the minimum inhibitory concentration (MIC) assay and carbapenem resistance also by the E-test. Results were interpreted following EUCAST 2022. By PCR, the carbapenem-resistant blaOXA-48, blaNDM-1, blaVIM, blaKPC, blaIMP genes and the colistin-resistance genes mcr-1 to mcr-5 were tested. All E. coli strains were tested for stx1, stx2, and eae STEC virulence genes.

Results. Forty-three food samples out of 189 (22.7%) were contaminated by AMR E. coli strains. The most frequently contaminated sample types included chicken carcasses (20.0 %), beef minced meat (17.9%) and chicken meat (16.0%). A high proportion of isolates exhibited multidrug-resistant profiles. The highest resistance rates were observed for β-lactams (44%), third-generation cephalosporins (23%), and fluoroquinolones (23%). Twenty-six E. coli strains (60.6%) harbored colistin-resistant genes, with prevalences ranging from 46.6% (mcr-1) to 38.5% (mcr-2) and 34.6% (mcr-3). Colistin MIC values ranged between 4 and 32 µg/mL. Regarding carbapenemase-encoding genes, blaOXA-48 and blaVIM were detected in 18.6% and 4.6 % of the isolates, respectively. One E. coli strain (2.3%) harbored both blaVIM and blaIMP. Among AMR E. coli isolates, three stx1-positive STEC strains (6,9%) were identified; they were isolated from samples of butter, chicken carcass and minced chicken. One eae-positive EPEC strain (2.3%) was isolated from a beef sample.

Conclusions. In this study, a high prevalence of carbapenem- and colistin-resistant E. coli isolated from foods placed on the market in Algeria was observed. The high frequency of HPCIA-resistant E. coli found in poultry products is of concern. In addition, the detection of STEC harboring resistant genes to carbapenems and colistin from butter and chicken could pose severe threat to human health. These findings highlight the need to strengthen AMR surveillance throughout the food chain and to promote the prudent use of antimicrobials in food-producing animals in Algeria to limit the emergence and spread of bacteria resistant to HPCIAs.