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Epidemiology of plasmid-mediated quinolone resistance determinants in bacterial isolates from animals and foods with co-resistance to several antibiotics

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Background: The use of (fluoro)quinolones both in humans and animals has contributed to the selection of resistant bacteria, limiting the agents available for treatment. This study aims to search for plasmid-mediated quinolone resistance (PMQR) determinants to give information about these expanding resistance mechanisms, their capacity of dissemination among different bacteria by mobile elements, and the role that they play in facilitating co-resistance to several antimicrobials.

Methods: In this work we investigated a collection of Escherichia coli (n=183) and Salmonella spp (n=186) isolates recovered from several types of consumable meat (n=93) and from samples collected from food-producing animals received from diagnostic (n=276). Antibiotic susceptibility testing against different classes of antibiotics was performed by disk diffusion and MICs were determined by E-test for PMQR-positive isolates. Molecular characterization of the isolates included PCR detection of PMQR determinants and of beta-lactamase-encoding genes (for putative producing isolates with diminished susceptibility to beta-lactams); the respective coding proteins were identified through nucleotide sequencing. Class 1 integrons (int1 gene) were searched by PCR.

Results: Overall, we detected 19/369 PMQR determinants, namely 11 QnrS1 in E. coli isolates from poultry. Two of these strains also carried TEM-1 beta-lactamase and one of them carried TEM-135 plus SHV-108 (ESBLs). Among the 6 QnrB detected, we identified 3 QnrB19: one in an E. coli (from a pig) and 2 in Salmonella spp isolates (from poultry), and 3 QnrB2 in Salmonella spp isolates (from embryonated eggs). We also have detected 2 Aac-(6')-Ib-cr in E. coli and Salmonella spp isolates, from broiler and bovine origin, respectively. One isolate carrying Aac-(6')-Ib-cr was from consumable meat. Among PMQR-negative isolates, we detected one DHA-type (plasmid-mediated AmpC β-lactamase) Salmonella spp-producing

isolate, as well as one SHV-12 and one TEM-135 (ESBLs) E. coli-producing isolates. Class 1 integrons were detected among 8 out of 19 PMQR-positive isolates, but were not always associated to multidrug-resistance (MDR).

Conclusions: This investigation has demonstrated that PMQR may act additively with other plasmid-encoded resistance mechanisms in 16% of studied isolates and in 42% may be disseminated by plasmids carrying class 1 integrons, contributing to the scenario of MDR in animal production facilities.

Keywords: PMQR, beta-lactamases, veterinary