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Co-occurence of MCR-1 and BLAKPC-2 genes in a clinical isolate of escherichia coli from Brazil

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Background: In November 2015, Liu and colleagues described for the first time a plasmid mediated colistin resistance in Escherichia coli from animal and human sources, this mechanism was attributed to mcr-1 gene. The mcr-1 gene was further described in several countries mostly in E. coli associated to several different plasmid backbones. In view of the concerning spread of antibiotic resistance, the aim of this study was to screen clinical isolates of Enterobacteriaceae for the presence of the mcr-1 gene. Methods: We retrospectively screened a total of 2136 clinical isolates of carbapenem-resistant Enterobacteriaceae (CRE) obtained between 2013 and 2016 recovered during a surveillance study in southern Brazil. The mcr-1 gene was screened in pools of suspension of 20 isolates. DNA was extracted from the pools and submitted to PCR using specific primers. Isolates from the pool with positive result were tested individually for PCR. Conjugation experiments were performed using the E. coli J53 as a receptor strain and the susceptibility profile was evaluated by Etest (carbapenem) and by broth microdilution (colistin). Whole genome sequencing (WGS) was carried out in a MiSeqTM platform (Illumina, Inc). Results: We were able to identify the mcr-1 gene in only one E. coli clinical isolate which was also positive for the blaKPC-2 gene (isolate number 3431F). This isolate was obtained in 2014, from a rectal swab of a patient at the emergence room of a hospital. The isolate 3431F presented minimal inhibitory concentration (MIC) of 4 µg/ml and 32 µg/ml, of colistin and meropenem, respectively. Conjugation experiments demonstrated that mcr-1 and the blaKPC-2 were present in different plasmids and that both plasmids were successfully transferred to E. coli J53. The in silico analyses of the WGS data indicated that the 3431F isolate belongs to the ST744 and detailed analysis of the WGS also indicated that the blaKPC-2 was located in an IncFIB plasmid and the mcr-1 in a IncX4. Conclusion: The prevalence of the mcr-1 gene among clinical isolates of CRE was very low in southern Brazil. Nevertheless, since polymyxins are considered as last resort antibiotics for the treatment of infections caused by CRE, the vigilance of isolates harboring carbapenem and colistin resistance is of great concern to public health. To the best of our knowledge, this is the first description of a clinical isolate harboring both blaKPC-2 and mcr-1 genes in Latin-America. Palavras-chaves: polymyxin, carbapenem, resistance genes