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Application of a new molecular biology method for carbapenem-resistant *Enterobacteriaceae* detection in rectal swabs

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Background: The extreme ease with which the CPEs (Carbapenemase Producing Enterobacteriaceae) spread, requires the implementation of an effective screening program that allows the rapid identification of resistant strains. In this study we evaluated the diagnostic utility of an innovative molecular biology method for CPE detection in rectal swabs. Furthermore, we verified the percentage of rectal colonization as a predictive event for CPE bacteremia in the patients.

Materials/methods: In February-March 2019, 153 rectal swabs from intensive care unit (36%), hematology (19%), cardiology (17%), and other departments (28%) were examined. All the samples were analyzed by phenotypic method on McConkey with Ertapenem disk and E-test on MH for Meropenem (Biomerieux) and examined by Real-time PCR multiplex, using Allplex Entero-DR Assay kit (Allplex, Seegene, Republic of Korea) on automatic system Nimbus IVD (Seegene) which allows to identify simultaneously 8 resistance genes: KPC, VIM, NDM, IMP, OXA-48; van-A, vanB; CTX-M. Blood cultures were analyzed with automatic Bactec FX (BD) system, subcultures from positive vials and identification by mass spectrometry (MALDI-TOF Bruker). Antibiograms were performed with Phoenix instrument (BD) and interpreted according to EUCAST criteria.

Results: The results obtained by phenotypic method and molecular screening indicate a perfect agreement between the two tests for 135 samples (88%). In particular, 20 (13%) were positive for the molecular method only, for CPE resistance genes, 115 samples (75%) agreed on negativity and positivity to resistance genes for ESBL and VRE genes, 59% (10 of 17) of patients with positive molecular analysis and negative culture had already been positive before. We also evaluated how many of the examined patients, positive for CPE rectal colonization, subsequently developed bacteremia: 25% (39 patients) of patients tested were affected by bacteremia caused by the same micro-organism.

Conclusions: The application of new molecular biology techniques in surveillance allows the rapid detection of CPE and given the extreme sensitivity of the method, is able to detect the presence of resistance genes early even in conditions of low bacterial load. This approach offers the clinician useful information for patient management and the possibility of promptly administering the most appropriate antibiotic therapy to counteract a possible bacteraemia.

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