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Antimicrobials: Epidemiology of MDR-Gram-negatives

Emerging carbapenemase-producing multidrug-resistant bacteria in university hospital Bonn, Germany

M. Parcina¹, E. Hoffmans¹, A. Hoerauf¹, I. Bekeredjian-Ding¹

¹Institute of medical Microbiology Immunology and Parasitology, University Hospital Bonn, Bonn, Germany

Objective: Emerging multidrug-resistance in *Enterobacteriaceae*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii* is of great importance in all hospitals worldwide and is a global health problem. The aim of the study was to investigate the molecular epidemiology and the genetic support of carbapenem resistance in MDR (Multi-Drug Resistant) Gram-negative rods in University Hospital Bonn, Germany.

Methods: For the last 2 years we introduced cultural screening methods for MDR Gram-negative rods in all admitted patients. Additionally to the entry screening, the weekly surveillance of all intensive-care patients was performed. The screening and surveillance materials were: tracheal secretions, sputum; wound, throat, anal and inguinal region swabs. Identification and antimicrobial susceptibility testing was performed on Vitek MS and Vitek-2 platform. All tested isolates were typed by in-house established high resolution melt (HRM) curve analysis utilizing: OXA-48, KPC-1/-2, VIM-1/-2, NDM, GES, IMP and OXA-23 specific primers in a single PCR reaction. The analysis of ertapenem hydrolysis via MALDI was used to detect other possible carbapenemase that were not covered with in house HRM PCR method.

Results: From November 2012 until November 2013 a total of one hundred and eighty-three (n=183) isolates were identified to be intermediary or resistant to one or more carbapenems tested according to EUCAST breakpoints. Half (n=94, 51,4%) of all isolates were tested positive for carbapenemase by in-house established PCR described previously.

OXA-48 was the most common carbapenemase found in 36,2% (n=34) of all positive tested isolates, followed by: 28,7% of VIM-1/-2 (n=27), 14,9% of OXA-23 (n=14), 12,8% of KPC-1/-2 (n=12), 4,3% of NDM (n=4,3), 1,1% of GES (n=1) and 2,1% of OXA-48/NDM (n=2) double positive isolates. No IMP-positive isolates were detected during the study period.

The most common isolate among carbapenemase-positive strains was *Klebsiella pneumoniae* 51,1% (n=47), followed by: *Pseudomonas aeruginosa* 25% (n=23), *Acinetobacter baumannii* 16% (n=15), *Escherichia coli* 4,3% (n=4) and *Enterobacter cloacae* 2,1% (n=2). Additionally some extraordinary carbapenemase-bearing strains were found: VIM-positive *Klebsiella oxytoca* and *Citrobacter youngae* both as unique isolates and an OXA-48-bearing *Serratia marcescens*. Carbapenemase-positive strains (n=94) were isolated from 81 different patients of whom 39,5% (n=32) were non-German residents. Of note, nine of the patients were colonized with 2 or more different carbapenemase-bearing strains.

Conclusion: Due to increasing numbers of carbapenemase-bearing strains at University Hospital Bonn the fast and effective screening molecular methods directly from clinical specimens is needed. To limit the spread of the bacteria in a hospital environment, an active surveillance of critical medical care is of major importance.