R2598

Abstract (publication only)

Outbreak of metallo beta-lactamase (MBL)-producing Pseudomonas aeruginosa in a hospital in the Czech Republic

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Objectives: In Czech Republic, only sporadic cases of carbapenemase-producing bacteria have been observed. Aim of the study was to analyze an outbreak of meropenem-non-susceptible Pseudomonas aeruginosa obtained from patients hospitalized in University Hospital of Brno, Czech Republic during 2011. Methods: A total of 14 meropenem-non-susceptible P.aeruginosa were examined. MICs of 10 antimicrobials were determined by broth microdilution method. In all isolates, production of MBLs was tested by a double disc synergy test (DDST) with meropenem and EDTA discs, and was confirmed by the MALDI-TOF MS hydrolysis assay. The presence of blaMBL genes was identified by PCR followed by sequencing. All isolates were tested by multilocus sequence typing (MLST), conjugation and transformation experiments. Localization of blaMBL genes was studied by the S1 nuclease method followed by hybridization with specific probes. Results: The isolates were recovered from a variety of clinical specimens, mostly urine (n=4), and wound swab (n=3). DDST yielded positive results for all isolates, whereas MALDI-TOF analysis confirmed carbapenemase activity in 10 of the isolates. In particular, seven isolates produced VIM, two IMP, and one both MBL types. MLST analysis classified the isolates in 5 sequence types (STs). Production of MBLs was only associated with P.aeruginosa of STs 357 and 111. VIM-encoding integrons from isolates of ST357 consisted of a sole blaVIM-2 cassette, while of ST111, included aacA29a and blaVIM-2 cassettes. Sequence of IMP-encoding integron revealed a novel cassette array containing aacA4, orf105/orfD, blaIMP-7, aacA4, blaOXA-2 and orfE-like cassettes. Conjugation and transformation experiments were unsuccessful to transfer the beta-lactamase genes. The S1 nuclease method confirmed the chromosomal location of both blaMBL genes. All MBL-producing isolates were resistant or non-susceptible to all beta-lactams, including meropenem, and ciprofloxacin. Conclusion: This is the first report of a nosocomial outbreak of P.aeruginosa producing MBL enzymes from Czech Republic. Two clones producing VIM-2 or/and IMP-7 were responsible for this outbreak. Also, coproduction of VIM-2 and IMP-7 metallo-beta-lactamases in a clinical strain was described for the first time. IMP-7-encoding integron was different to integrons previously found in IMP-7-producing P.aeruginosa of ST357 from Czech Republic. This work was supported by NT11032-6/2010 and CZ.1.07/2.3.00/30.0022 grants.