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First evaluation of the new selective medium BD BBL CHROMagar CPE for the detection of carbapenemase-producing bacteria

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Background: The spread of Carbapenemase-producing Gram-negative bacteria poses a serious impact on the health care system. Specific and reliable screening methods are of importance to prevent the spread of these organisms. In this study we evaluated the new selective agar medium, BD BBL™ CHROMagar™ CPE (C-CPE) for the detection of Carbapenem-resistant *Enterobacteriaceae* in rectal swabs and other clinical specimens. The results were compared to chromID® CARBA SMART Agar (CARB/OXA) (CID-C/O) (bioMérieux) used in laboratory routine. As reference media MacConkey II Agar and Columbia CNA Agar with 5% Sheep Blood, Improved II (both BD) were used. The Carbapenemase-producing bacteria were confirmed using phenotypic and molecular methods.

Material/methods: The study first sought to determine the limit of detection (LoD) of the media by testing 34 isolates with characterized carbapenemase-resistance mechanism (OXA-48 like, KPC, NDM, VIM, IMP, GIM, GES). Additionally 3 *Enterobacteriaceae* species with other resistance mechanisms (ESBL, *amp*C and porin loss) were included as negative control. Briefly, an inoculum of McFarland 0.5 was adjusted followed by a series of eight 10-fold dilutions (100 µl) for each of the isolates. For the second part of the study 227 remnant clinical swab specimens (n=180 rectal, n= 47 other specimen types) from routine laboratory investigations were streaked in the following order: MacConkey II Agar, C-CPE and Columbia CNA Agar with 5% Sheep Blood, Improved II. Grown *Enterobacteriaceae* colonies were tested with Etest, VITEK 2, CarbaNP test, Carbapenemase activation method (CIM), Mast Carbapenemase Detection kit and PCR (Real Time PCR (inhouse), AID line probe assay). All tests were performed according to manufacturer´s instructions.

Results: Out of 227 swab specimens collected for the direct evaluation of the new C-CPE agar, 21 (9 %) specimens showed growth of carbapenemase-producing *Enterobacteriaceae* on the reference media. The calculated sensitivities and specificities of C-CPE were 100 % and 93.7 %, respectively. The comparator medium CID-C/O which includes two compartments (CARB/OXA) showed a combined sensitivity of 95.2% and a specificity of 94.9% for the CARBA- and 99.1% for the OXA-compartment, respectively. The C-CPE and the CID-C/O test media showed a LoD of $<10^1$ CFU/ml for 29 and 24 of the test strains, respectively. For one strain detection limit was 10^2 for each of the media. 4 strains were not detected efficiently by C-CPE and 7 were not detected by CID-C/O, respectively. The negative control isolates showed no growth.

Conclusions: The CHROMagar CPE agar medium evaluated in the study showed excellent sensitivity and good specificity for direct detection of Carabapenemase-producing *Enterobacteriaceae* in rectal swabs and other clinical specimen.