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ePoster Session
Getting better and faster: resistance detection

Validation of the BYG test version 2.0: an even more rapid and simplified protocol for laboratory detection of carbapenemase-producing Enterobacteriaceae

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Background: Accurate detection of carbapenemase-producing Enterobacteriaceae (CPE) constitutes a major laboratory diagnostic challenge. Recently, several imipenem hydrolysis-based tests have been developed in order to detect CPE. We also designed and validated an electrochemical technique (BYG test v1.0) which detects CPE from a concentrated bacterial suspension (10 µl loopful bacteria). Here we have evaluated the BYG test v2.0 (BYG 2.0) which relies on a simplified and faster protocol.

Material/methods: A single colony taken from an overnight culture on TSA blood agar is deposited directly on the working electrode of the BYG test and overlaid immediately by 50 µL of a modified in house lysis buffer with or without 3 mg/mL imipenem. The modification of pH and redox consecutive to the imipenem hydrolysis is then interpreted by an electronic reader and visualized on a personal computer as a real time curve. The BYG 2.0 was evaluated successively against: i) 57 collection isolates (41 CPE-positive and 16 CPE-negative); ii) 150 suspected CPE isolates that had been referred in 2014 to the national reference laboratory; iii) 260 Enterobacteriaceae isolates received in the same context between August and December 2015. The BYG 2.0 was assessed in parallel with BYG 1.0 and CarbaNP test using molecular test results as reference method.

Results: Among 57 collection isolates, all but one GES-6-carbapenemase-producing isolates were correctly identified by the BYG 2.0 as for BYG 1.0. Among 150 retrospective *Enterobacteriaceae* isolates (68 with no carbapenemase and 82 CPE [51 OXA-48, 13 KPC, 10 NDM, and 8 VIM]), all were correctly identified with the BYG 2.0 (sensitivity and specificity 100 %) while BYG 1.0 failed to detect 4 OXA-48 (sensitivity 95.1 %, specificity 100 %) and the CarbaNP missed 7 OXA-48 producers (sensitivity 91.2 %, specificity 100 %).Time to positivity was observed in less than 10 minutes for 77 (63/82) and 93 % (76/82) for the BYG V1.0 and the BYG V2.0, respectively. On the 260 prospective isolates (115 with no carbapenemase and 145 CPE [100 OXA-48, 17 KPC, 16 NDM, 10 VIM, 1 IMP, 1 OXA-48+NDM]), the BYG 2.0 yielded sensitivity, specificity, PPV and NPP of 99.3, 99.1, 99.3 and 99.1 %, respectively (1 OXA-48 went undetected and one *E. cloacae* yielded a slight but non-repeatable false-positive result). Moreover, 62 % (90/145) and 94 % (136/145) of the CPE were detected in less than 5 and 10 minutes, respectively.

Conclusions: The BYG test, an electrochemical semi-quantitative objective assay, detects more than 90 % of the CPE tested in less than 10 minutes. The BYG 2.0 protocol allows direct analysis of imipenem hydrolysis from single colonies and avoids the requirement of highly concentrated bacterial suspension.