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Evaluation of the simplified carbapenem inactivation method (sCIM) for detection of carbapenemase-producing gram-negative bacilli

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ABSTRACT

Title

Evaluation of the simplified carbapenem inactivation method (sCIM) for detection of carbapenemase-producing Gram-negative bacilli

Background and Objectives

Currently, prompt phenotypic detection of carbapenemase-producing Enterobacterales by clinical laboratories is a challenge. Available techniques are expensive, strenuous, delay results and are unsuitable for high throughput laboratories. This study evaluates the performance of the sCIM against the Modified Hodge and Imi-EDTA tests as an alternative method to detect carbapenemase enzymes in Gram-negative bacilli.

Methodology

A prospective laboratory-based study, comprising of 137 well characterised stored isolates. These included 96 Enterobacterales, 23 *Acinetobacter baumannii,* and 18 *Pseudomonas aeruginosa* isolates tested with the sCIM. The performance of the sCIM was compared to the Modified Hodge test and Imi-EDTA with the multiplex PCR used as a reference gold standard.

Results

Overall, we report 95.8% accuracy of the sCIM when testing Enterobacterales, 95.6% for *Acinetobacter baumannii,* and 77.8% for *Pseudomonas aeruginosa* using PCR as the gold standard. There was a significant correlation of 95.4% sensitivity and 100% specificity in testing both Enterobacterales and *Acinetobacter baumannii* isolates with the sCIM. Contrary to expectation both Enterobacterales and *Acinetobacter baumannii* showed low NPV of 69.8% and 50% respectively, whilst the PPV was 100% on both. *Pseudomonas aeruginosa* isolates showed 40% sensitivity, 92.3% specificity, 66.6% positive predictive value, and 80% negative predictive value.

Conclusion

Notwithstanding the lack of agreement with our low NPV, the sCIM demonstrated an acceptable performance as described in previous studies. It is inexpensive, less tedious and suitable for use in high throughput laboratories with reliable and consistent results.