12. Evaluation of Rapid Phenotypic Testing for KPC Carbapenemase Producing Klebsiella Pneumoniae Directly from Positive Blood Cultures by Use of "Hot Chocolate" Plates

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Background. Invasive infections with Carbapenemase Producing Enterobacteriaceae are associated with considerable morbidity and mortality, in part due to the risk of inappropriate empiric therapy. Consequently, the rapid identification of carbapenem resistance is crucial to the management of these infections. We sought to evaluate possible reductions in turnaround time to identification of this resistance in blood cultures growing these organisms by applying rapid phenotypic test kits to growth from "hot chocolate" plates.

Methods. 30 blood cultures, spiked with carbapenem resistant Klebsiella pneumoniae isolates or susceptible controls, were inoculated onto chocolate agar plates that had pre-warmed at 37°C. These plates were incubated at 37°C for 3.5 hours. The resulting minimal growth was then identified using MALDI-TOF and underwent rapid phenotypic testing using three commercially available products (β-lacta and β-carba, from Bio-Rad, Marnes-la-Coquette, France, and Carba-NP, from bioMérieux, Durham, NC). The time to identification of carbapenem resistance using this method was then compared to that of the conventional laboratory workup.

Results. The identification was 100% accurate to the species level using MALDI-TOF up to the 3.5 hour growth on the "hot chocolate" plates. The β-lacta kit identified resistance to 3rd generation cephalosporins for all ESBL and carbapenemase producing Klebsiella pneumoniae isolates, while the β-carba and Carba-NP kits identified carbapenem resistance only in the carbapenemase producers. The sensitivity of all assays was 100% (95% CI 0.87-1.0) and the specificity of carbapenemase detection was 100% (97.5% one-sided CI 0.4-1.0). The corresponding sensitivities and specificities of direct disc diffusion for eritapenem resistance detection were 88.5% (95% CI 0.70-0.98) and 100% (95% CI 0.40-1.0) respectively. The turnaround time for the rapid kits coupled to the "hot chocolate" plates was 4.25 to 5.1 hours as compared to 16 hours for the conventional workup.

Conclusion. Rapid phenotypic tests performed after inoculation of "hot chocolate" plates are highly sensitive for the presence of carbapenemase production and can be incorporated into the laboratory workflow for Klebsiella pneumoniae with important reductions in turnaround time.

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