

Rapid detection of antibiotic resistance in direct urine samples

M.W. Bot^{*1,2}, J. Flipse¹, S.L.M. Bongers^{1,2}, J.J. Hoogerwerf³, J. ten Oever³, H.F.L. Wertheim², M.P.A. van Meer¹

¹*Department of Medical Microbiology and Immunology, Rijnstate hospital, Arnhem, the Netherlands*

²*Department of Medical Microbiology, Radboud University Medical Center, Nijmegen, the Netherlands*

³*Department of Internal Medicine, Radboud University Medical Center, Nijmegen, the Netherlands*

Background

The rise of antibiotic resistance in Gram-negative bacteria threatens successful treatment of infections, increasing the need for last-resort antibiotics, and consequently the risk of overtreatment. Rationalising the use of these last-resort antibiotics can be done using early diagnostics for antimicrobial resistance. In this study, we aim to compare the Rapid ESBL NP test (Liofilchem, Roseto degli Abruzzi, Italy), a biochemical test which detects changes in pH caused by the hydrolysis of the β -lactam ring by ESBL enzymes, to the current culture-based antimicrobial susceptibility tests as the gold standard. This rapid test was compared on diagnostic characteristics and time to perform.

Methods

A total of 218 urine samples were collected from two Dutch hospitals, of which 67 contained ESBL-producing bacteria, 101 contained non ESBL-producing bacteria and 50 were negative controls. Detection of antimicrobial resistance was done using the Rapid ESBL NP test and compared to standard culture-based antimicrobial susceptibility testing according to EUCAST. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated with 95% confidence intervals.

Results

After excluding the non-interpretable results (7.3%), the Rapid ESBL NP test has a sensitivity, specificity, PPV and NPV of 96.8% (95%CI: 89.0-99.6), 100% (97.4-100.0), 100.0% (94.1-100.0) and 98.6% (94.7-99.6), respectively. Results from the Rapid ESBL NP test can be obtained in an hour. In additional experiments we showed that non-interpretable results could be prevented by filtering very cloudy urine samples prior to performing the Rapid ESBL NP test.

Conclusions

The Rapid ESBL NP test can be a suitable screening tool for ESBL-producing bacteria in clinical urine samples as the test takes an hour to perform. This could ensure better initial prescription of last-resort antibiotics while awaiting the more accurate and extensive culture-based results, which can take 48 – 72 hours. Optimisation of this rapid test could be achieved by adding an extra filtering step of the samples in case of very cloudy urines.

Demord A, Poirel L, D'Emidio F, Pomponio S, and Nordmann P (2021) Rapid ESBL NP Test for Rapid Detection of Expanded-Spectrum β -Lactamase Producers in Enterobacterales. *Microb Drug Resist*. 27(8):1131-1135. DOI: 10.1089/mdr.2020.0391