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Microtiter plate with built-in oxygen sensors: a novel approach to investigate the dynamics of *Pseudomonas aeruginosa* growth suppression in the presence of divalent cations and antibiotics

Wafa Almatrood, Ismini Nakouti, Glyn Hobbs
Centre for Natural Products Discovery (CNPD), School of Pharmacy and Biomolecular Sciences, Liverpool John Moores University, Liverpool, UK

Abstract:

The depletion of dissolved oxygen in a defined synthetic medium can be measured in real time, using a micro-well plate format, associated with a fluorescent plate reader. This technology is appropriate for investigating the effect of antibiotics on cell kinetics because there is a direct correlation between the latter and the amount of dissolved oxygen in the medium of an assay. In this study, the metabolic activity of the opportunistic human pathogen *Pseudomonas aeruginosa* PA01 was investigated using the OxoPlate OP96U optical sensor technology. The response of *P. aeruginosa* to aminoglycoside antibiotics when Ca^{2+} and Mg^{2+} ions are present in the Evans defined synthetic medium was measured. The results revealed that the effect of antibiotics on *P. aeruginosa* is influenced by the concentration of divalent cations present in the test medium, although the efficiency of Ca^{2+} in supressing antibiotic activity was found to be greater than that of Mg^{2+}. By comparison to tobramycin, the effect of amikacin is largely inhibited by the Ca^{2+} and Mg^{2+} concentrations. The study results underscore that the reliability of the observation of growth inhibitors is enhanced by the oxygen consumption measurements. Thus, the OxoPlate OP96U system is proven to be an accurate method to test the effectiveness of antibiotic treatments against *P. aeruginosa*.

Keywords: *Pseudomonas aeruginosa* PA01, OxoPlate OP96U, antibiotics, Ca^{2+}, Mg^{2+}