Standardization of a Methodology for Quantification of Antimicrobials Used for the Treatment of Multi-Resistant Bacteria Using Two Types of Biosensors and Production of Anti-Antimicrobial Antibodies

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Abstract : Bacterial resistance to antimicrobial treatment has increased significantly in recent years, making it a public health problem. Large numbers of bacteria are resistant to all or nearly all known antimicrobials, creating the need for the development of new types of antimicrobials or the use of “last line” antimicrobial drug therapies for the treatment of multi-resistant bacteria. Some of the chemical groups of antimicrobials most used for the treatment of infections caused by multiresistant bacteria in the clinic are Glycopeptide (Vancomycin), Polymyxin (Colistin), Lipopeptide (Daptomycin) and Carbapenem (Meropenem). Molecules that require therapeutic drug monitoring (TDM). Due to the above, a methodology based on nanobiotechnology based on an optical and electrochemical biosensor is being developed, which allows the evaluation of the plasmatic levels of some antimicrobials such as glycopeptide, polymyxin, lipopeptide and carbapenem quickly, at a low cost, with a high specificity and sensitivity and that can be implemented in the future in public and private health hospitals. For this, the project was divided into five steps i) Design of specific anti-drug antibodies, produced in rabbits for each of the types of antimicrobials, evaluating the results by means of an immunoassay analysis (ELISA); ii) quantification by means of an electrochemical biosensor that allows quantification with high sensitivity and selectivity of the reference antimicrobials; iii) Comparison of antimicrobial quantification with an optical type biosensor; iv) Validation of the methodologies used with biosensor by means of an immunoassay. Finding as a result that it is possible to quantify antibiotics by means of the optical and electrochemical biosensor at concentrations on average of 1,000ng/mL, the antibodies being sensitive and specific for each of the antibiotic molecules, results that were compared with immunoassays and HPLC chromatography. Thus, contributing to the safe use of these drugs commonly used in clinical practice and new antimicrobial drugs.

Keywords : antibiotics, electrochemical biosensor, optical biosensor, therapeutic drug monitoring
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