Design and optimization of an electrochemical genosensing platform for *BDNF Val66Met* polymorphism detection

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Background: Major depressive disorder (MDD) is a debilitating and highly prevalent psychiatric illness. Antidepressant drugs (AD) have remained the main pharmacological treatment for this condition, and since their discovery and despite their high efficacy, insufficient remission rates and treatment-resistant depression remain a cause of concern for clinicians. The *BDNF* gene is an extensively studied gene regarding depression and AD response rates. Moreover, the *rs6265* (*Val66Met*) non-synonymous single nucleotide polymorphism (SNP) has been linked to variable remission rates to ADs [1]. Therefore, there is a growing interest in genotyping approaches to detect SNPs, such as the Val66Met, to better suit patients' needs. Current SNP identification procedures are based on the polymerase-chain reaction (PCR) technique. This methodology, although extremely efficacious, is time-consuming, requires expensive equipment and highly trained personnel. Thus, the development of cheaper, faster and lower-cost genotyping tools, such as electrochemical genosensors, capable of detecting an electrochemical signal from a hybridization event between DNA probes, is warranted. **Objective:** To develop a genotyping platform based on the electrochemical biosensing principles, capable of distinguishing Val66Met genotypes. **Methods:** Two specific target DNA sequences of interest from the Val66Met SNP were selected and designed. Employing screen-printed gold electrodes (SPGE) as transducers, the genosensor development protocol included four stages: pre-treatment; sensing phase; sandwich DNA hybridization and electrochemical detection. The electrochemical detection was carried out through chronoamperometry techniques. **Results:** Several experimental conditions, such as capture probe and antibody concentrations, were successfully optimized. Furthermore, a calibration curve employing different target concentrations was obtained. The DNA sequence complementary to the capture probe showed greater current signals than the non-complementary, as expected. **Conclusions:** The developed methodology showed consistent results, with the genosensor exhibiting the ability to distinguish between both DNA targets. A linear relationship between DNA target concentration and current intensity was achieved between 0.10 $nmolL^{-1}$ to 2.0 $nmolL^{-1}$.

Keywords: *BDNF*; electrochemical genosensors; major depressive disorder; polymorphisms.

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References

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