A Graphene Oxide-Based Electrochemical Biosensor for the Detection of Pathogenic Microorganisms

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Abstract

Pathogenic microorganisms are the causative agents that cause various infectious diseases and even death worldwide. Pathogens refer to including bacteria, viruses, fungi and parasites. Despite the victories gained with developed vaccines and antibiotics, new and multidrug-resistant pathogens constantly emerge [1,2]. They cause deaths worldwide by infecting their hosts through various means, especially through food, water and air. Bacteria such as *Escherichia coli* and *Staphylococcus aureus* as well as viruses such as *influenza* and *norovirus* are among the most common pathogens [3]. The early diagnosis of pathogenic microorganisms that cause infectious diseases is essential. Electrochemical biosensors, with their improved specificity, sensitivity, label-free nature, and cost-effectiveness, hold great promise for the rapid detection of various diseases. Nanomaterials provide great impact in the development of biosensing platforms such as high surface area, high electrical conductivity, biocompatibility, high sensitivity and selectivity [4]. Graphene oxide (GO), is a two-dimensional (2D) graphene derivative containing oxygen functional groups on its surface. It has become the basis of many advanced biosensors due to its extraordinary properties such as a high surface area, being biocompatible, having a stable structure, and electrical conductivity [5].

In this study, a novel label-free electrochemical genosensor was developed for the detection of pathogenic microorganisms using graphene oxide-modified disposable graphite electrodes (GO-PGEs). *Escherichia coli (E. coli)* bacteria was used as a model microorganism. The hybridization of complementary and non-complementary sequences to *E. coli* DNA probe immobilized to GO-PGE was monitored using electrochemical impedance spectroscopy (EIS) technique. The nanogenosensor was optimized for higher specificity and sensitivity. The optimized nanogenosensor successfully detected the PCR real samples**.** The designed nanogenosensor was submit the high selectivity and sensitivity for the diagnosis of pathogenic microorganisms. This platform can be extended further to develop biosensors for the detection of various other pathogenic microorganisms or microbiological diseases.

References

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