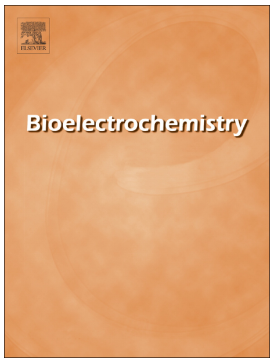

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An impedimetric biosensor for DNA damage detection and study of the protective effect of deferoxamine against DNA damage

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Abstract

The detection and inhibition of DNA damage are of great importance in the prevention and treatment of diseases. Developing a simple and sensitive tool for this purpose would be a chance to monitor the DNA damage and could be helpful in introducing some drugs which can prevent this phenomenon. Here, we report a novel and sensitive electrochemical biosensor based on DNA/Au nanoparticles (AuNPs) modified screen printed gold electrode (DNA/AuNPs/SPGE) to investigate the DNA damage process and also to study the protective behavior of deferoxamine (DFO). The proposed biosensor was fabricated by electrodeposition of AuNPs onto SPGE, followed by chemical immobilisation of thiol-terminated DNA. Cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and scanning electron microscopy (SEM) have been used to characterise this biosensor. Hydroxyl radical ($^{\bullet}$OH), which is generated during the Fenton reaction, is responsible for the induced damage to the DNA. EIS technique was applied to monitor the DNA damage, and the increase in charge transfer resistance (R_{ct}) following the DNA damage, was considered as an indicator. Furthermore, the ability of the electrochemical screening system was proved by the investigation of the antioxidant effect of DFO in prohibiting the DNA damage.

Keywords: DNA damage; Au nanoparticles; Screen printed gold electrode; Deferoxamine

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