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Impedimetric nanostructured disposable DNA-based biosensors for the detection of deep DNA damage and effect of antioxidants

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Abstract

Novel impedimetric nanostructured disposable DNA-biosensors have been created using a layer of multiwalled carbon nanotubes (MWNT) and double stranded calf thymus or herring sperm DNA deposited on the surface of a screen-printed carbon electrode (SPCE) by layer-by-layer and mixed coverage. The presence of DNA significantly decreases the electroconductivity of the MWNT/SPCE interface and represents a charge barrier for the transport of the [Fe(CN6)]3- redox probe ions. Hence, electrochemical impedimetric procedure performed with DNA/MWNT/SPCE sensor in 0.1 M phosphate buffer solution (PBS) pH 7.0 using 1 mM [Fe(CN6)]3- was developed for the evaluation of deep DNA damage caused by reactive oxygen species formed in situ as well as antioxidative effects of rutin and tea extracts. Good correlation has been found between the charge transfer resistance change obtained as a parameter of the impedimetric equivalent circuit and the voltammetric current response change of the [Fe(CN6)]3- / [Fe(CN6)]4- redox couple measured at the DNA modified and bare SPCEs. © 2008 by ESG.

Keywords

Antioxidants, DNA damage, DNA electrochemical biosensor, Electrochemical impedance spectroscopy, Multiwalled carbon nanotubes