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Voltammetric Detection of Oxidative DNA Damage Based on Interactions between Polymeric Dyes and DNA

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Abstract

© 2016 Wiley-VCH Verlag GmbH & Co. KGaA, WeinheimOxidative damage of DNA was assessed with glassy carbon electrode (GCE) coated with electropolymerized Methylene Blue (MB). For this purpose, DNA solution was first mixed with an oxidant (Fenton reagent, H2O2 alone and in the presence of Cu(II) ions) and then placed on the polymeric film surface. After washing, the cyclic voltammogram was recorded in buffer solution and the anodic peak potential measured against that before the contact with DNA. Oxidative DNA damage resulted in remarkable decrease of the anodic peak potential which depended on the oxidant nature and incubation period. Specificity of the DNA – MB interactions was confirmed by surface plasmon resonance (SPR) measurements. Similar experiment performed with polymerized Methylene Green (MG) and Neutral Red (NR) showed lower selectivity of the response toward various sources of reactive oxygen species. The protocol of the DNA damage detection was tested on the estimation of antioxidant properties of green tea extract and red table wine.

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Keywords

Antioxidant, Electrochemical quartz crystal microbalance, Electropolymerization, Methylene Blue, Oxidative DNA damage