Abstract

Ultraviolet (UV) radiation is a common DNA damaging agent. Major DNA lesions, such as cyclobutane pyrimidine dimers (CPDs) and pyrimidine-(6-4)-pyrimidone (6-4PPs) photoproducts, are carcinogenic and mutagenic. UV induced DNA damage was investigated using a simple electrochemical DNA biosensor based on an ultra-trace graphite electrode (UTGE) and low molecular weight doble-stranded DNA (dsDNA) from salmon sperm. Biosensor was prepared using adsorption of dsDNA on a surface of the UTGE and then used to detect UV-induced DNA damage. Effects of UV radiation were investigated using a combination of several electrochemical technics: square-wave voltammetry (SWV) for direct monitoring of DNA base oxidation and cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS), as non-direct methods, using redox-active indicator $[Fe(CN)_6]^{4-/3-}$. CV and EIS, which allow characterization of electrode surface, were used to optimize preparation of the dsDNA/UTGE biosensor. Prepared dsDNA/UTGE biosensor was exposed to UV radiation using UV lamp with two set wavelengths: UVC of 254 nm and UVA of 365 nm. UVC radiation was used to damage DNA. Relative signal decrease was 50% after 20 minutes of exposure to UVC radiation. UVA radiation was used to compare effects of different types of UV radiation. Obtained results confirm that UV radiation causes structural changes, damage and degradation of DNA.