Flow Detection of UV Radiation-Induced DNA Damage at a Polypyrrole-Modified Electrode

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Abstract
A new electrochemical protocol for the detection of radiation-induced DNA damage, based on the coupling of a conducting-polymer detector and a flow injection system, is described. Changes in the interaction of DNA molecules with polypyrrole (PPy) films, after exposure to ultraviolet radiation, are exploited for generating the damage-sensitive current signals. Factors influencing the response of the flow detector, including the irradiation time or distance, are discussed. Injection rates of 30–60 per hour are obtainable in connection to 20 μL sample volumes and nanogram quantities of plasmid and chromosomal DNA. The new modified-electrode/flow-injection protocol offers great promise for detecting DNA damage in a faster and simpler manner compared to the common use of ordinary electrodes in batch systems. It also adds a new dimension of information based on the interfacial properties of damaged DNA at conducting-polymer/solution interfaces. The PPy-coated glassy-carbon electrode thus represents a useful addition to the arsenal of electrochemical tools for detecting DNA damage.

Keywords: DNA damage, Polypyrrole, UV radiation, Flow injection analysis, Conducting polymer, Flow detector