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Electrochemical sensor for evaluating oxidative stress in airway epithelial cells

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Abstract

Cigarette smoke exposure induces oxidative stress within the airways. Increased oxidative burden contributes to the pathogenesis of chronic lung disorders and is associated with aging and chronic inflammation. Airway epithelial cells highly contribute to Reactive Oxygen Species (ROS) generation within injured and inflamed lung tissues. Among ROS, hydrogen peroxide (H2O2) can be monitored in the extracellular space.

Herein, we present an amperometric/voltammetric sensor based on gold nanoparticles and graphene oxide able to detect H2O2 with good sensitivity and selectivity. Using this sensor, H2O2 release was measured in conditioned medium from primary bronchial epithelial cells (PBEC), bronchial epithelial cell line, 16HBE, and adenocarcinoma alveolar basal epithelial cell line, A549, exposed to cigarette smoke extracts (CSE). 16HBE were also treated with resveratrol, an anti-oxidant compound. The results were compared with those obtained by flow cytometry using the same cells stained with Carboxy-H2DCFDA and MitoSOX Red, which detect intracellular ROS and mitochondrial superoxide, respectively.

The exposure to CSE resulted in a significant increase of the cathodic current due to the reduction of H2O2 indicating an increased release. Addition of resveratrol decreased CSE-induced release of H2O2 in 16HBE. All the results paralleled those obtained by flow cytometry.

Smoking Epithelial cell

Footnotes

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