



Electrochemical sensor for evaluating oxidative stress in airway epithelial cells

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European Respiratory Journal 2021 58: PA3704; DOI: 10.1183/13993003.congress-2021.PA3704

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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.

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Cite this article as: European Respiratory Journal 2021; 58: Suppl. 65, PA3704.

This abstract was presented at the 2021 ERS International Congress, in session “Prediction of exacerbations in patients with COPD”.

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ISSN

Print ISSN: 0903-1936

Online ISSN: 1399-3003

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