The Response of Human Nasal and Bronchial Organotypic Tissue Cultures to Repeated Whole Cigarette Smoke Exposure

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Abstract

Exposure to cigarette smoke (CS) is linked to the development of respiratory diseases, and there is a need to understand the mechanisms whereby CS causes damage. Although animal models have provided valuable insights into smoking-related respiratory tract damage, modern toxicity testing calls for reliable in vitro models as alternatives for animal experimentation. We report on a repeated whole mainstream CS exposure of nasal and bronchial organotypic tissue cultures that mimic the morphological, physiological, and molecular attributes of the human respiratory tract. Despite the similar cellular staining and cytokine secretion in both tissue types, the transcriptomic analyses in the context of biological network models identified similar and diverse biological processes that were impacted by CS-exposed nasal and bronchial cultures. Our results demonstrate that nasal and bronchial tissue cultures are appropriate in vitro models for the assessment of CS-induced adverse effects in the respiratory system and promising alternative to animal experimentation.