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Research Summary

Novel Biomarkers of Vaping Exposure: Volatolomics Profiling of Human Exhaled Breath

Vitamin E acetate (VEA) is a chemical present in some ecigarette liquids that was found to be closely linked to previous cases of serious lung injury. VEA has been measured in bronchoalveolar fluid (BAL) of patients afflicted with this lung disease, but the collection of BAL is an invasive procedure. As VEA is volatile, we propose to measure this compound in the exhaled breath of Nova Scotia youth. Exhaled breath can be collected noninvasively from participants, reducing the stress and risk of sample collection. In addition to VEA, many other chemicals are released from an e-cigarette and inhaled during vaping, which may have toxic effects on the lungs. Measurement of these volatile organic compounds (VOCs) in e-cigarette users, traditional cigarette smokers, and non-smokers exposed to e-cigarette vapor could lead to the identification of specific biomarkers associated with vaping. Exhaled breath can be used to measure levels of exposure to these VOCs. The entirety of VOCs found in a specific bio-specimen such as exhaled breath is known as the "volatolome". These VOCs can be measured using thermal desorption-gas chromatography mass spectrometry (TD-GC-MS). We propose to profile the volatolomes of the study participants in the four different exposure groups (e-cigarette users, traditional cigarette users, those regularly exposed to second-hand e-cigarette vapor, and those who have never used traditional cigarettes or e-cigarettes and are not regularly exposed to e-cigarette vapor) as a novel biomarker of health effects of vaping. Through the use of GCMS library matching, the volatolomes of these exposure groups can be profiled. We also propose to correlate these volatolomes (profiles and levels) to the outcome of lung function tests and the lung health of young adults. The overall objective of this proposed research is to determine associations between the volatolomes of the participants in the four exposure groups and lung health outcomes in Nova Scotia youth. This study is the first to use exhaled breath to measure VEA and to profile the volatolome of young e-cigarette users as a novel biomarker of health effects of vaping to correlate tothe outcome of lung function tests.