Integrated Health, Behavioral and Economic Research on Current and Emerging Tobacco Products
Institution: University of California, San Francisco
9-U54-HL147127-06

PROJECT 1: IMPACT OF DIFFERENT E-CIGARETTE CHARACTERISTICS ON ACUTE LUNG INJURY
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Project 1 Abstract:
Over the past decade, use of electronic cigarettes (e-cigarettes) has been rapidly growing. Because e-cigarettes are relatively new to the market, there is little biologic data on their health effects, particularly how these health effects are affected by specific product characteristics. Experimental evidence can identify early signals of harm associated with e-cigarettes, but several important elements have been largely missing from prior studies, including (1) an assessment of pulmonary health effects after clinically relevant insults, like acute viral or bacterial infection; (2) an integrated assessment of acute pulmonary effects across cell culture, animal, and human models; and (3) a focus on specific device and e-liquid characteristics that are subject to regulation and might be modified to reduce adverse health effects. The UCSF TCORS has extensive experience studying the impact of tobacco products on acute lung injury using laboratory and human experimental models, and our preliminary data indicate that variation in e-cigarette characteristics may have a significant impact on pulmonary health. This project proposes a comprehensive assessment of the impact of varying e-cigarette characteristics on acute lung injury, combining data from cell culture, mouse models, and human subjects. The ***central hypothesis*** is that changes in e-cigarette device and liquid characteristics influence their acute pulmonary effects, both under healthy conditions and in the setting of acute respiratory infection and/or inflammation. This hypothesis will be tested via two ***specific aims***: (1) Test how different device characteristics (applied power and metal coil components) impact the acute pulmonary effects of e-cigarettes, including susceptibility to viral or bacterial lung injury in cell culture and in mice, and to inhaled endotoxin in human subjects (e-cigarette users and dual users); and (2) Test how different e-liquid characteristics (nicotine concentration and flavorings) impact the acute pulmonary effects of e-cigarettes, including susceptibility to viral and bacterial lung injury in cell culture and in mice, and to inhaled endotoxin in human subjects (e-cigarette users and dual users). Both aims begin with a systematic evaluation of the impact of varying e-cigarette characteristics in cell culture and mouse models. This evaluation will be conducted with and without infectious and inflammatory stimuli, including viral (influenza) and bacterial (pneumococcal) infection. The e-cigarette characteristics that appear to be most important in these models will then be tested in a well-established human experimental model of lung injury, in which healthy volunteers inhale endotoxin, followed by bronchoscopy with bronchoalveolar lavage. This project contributes to the overall UCSF TCORS theme by focusing on the acute pulmonary ***health effects*** of specific e-cigarette device and e-liquid characteristics. These studies will yield important new knowledge regarding how specific e-cigarette device and e-liquid characteristics impact their potential to cause acute lung injury, both in a state of health and in the setting of acute infectious or inflammatory stimuli, which will inform regulation of product characteristics.