The Smoking Gun: Toxicological Effects of Electronic Cigarettes on Epithelial Cells using Air Liquid Interface, Year Two

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Electronic-cigarettes, or Electronic Nicotine Delivery Systems (ENDS), represent a major public health issue, but little is known about their toxicological effects when inhaled. This study examined effects of aerosol generated from ENDS on a human lung bronchial epithelial cell line (H292). It is Phase 2 of research done last year, expanding the work and addressing its limitations. Cells were exposed to aerosol generated from different ENDS products, flavors, solvent, and battery voltages. Cells were exposed to ENDS vapor via air-liquid interface (ALI), simulating lung exposure conditions. In vitro toxicological effects were assessed using the trypan blue assay (measures cell viability) and the neutral red uptake assay (examines metabolic activity). Exposure to ENDS resulted in negative effects in both assays in 5 out of 6 ENDS products when compared to air controls. Conventional cigarettes had significantly higher effects in both assays than most tested products. Flavors had significant effects on both assays, while solvent composition only affected metabolic activity. Increased battery voltage (which increases temperature inside ENDS) was correlated with increased negative effects in both assays. Exposure to ENDS aerosol had significant negative effects on the viability and metabolic activity of H292 cells. Product characteristics including flavor, solvent, and battery affected toxicological effects of ENDS. While ENDS is damaging, data suggests that the use of propylene glycol solvent, specific flavors, and the lowest possible voltage reduce the toxic effects of product use.

Awards Won:
Second Award of $2,000