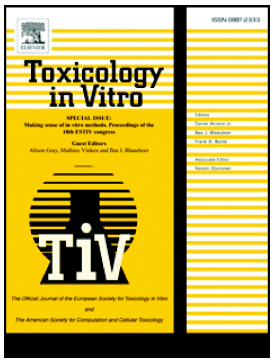

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Prediction of Delivery of Organic Aerosols onto Air-Liquid Interface Cells *in vitro* Using an Electrostatic Precipitator

Zechen Yu[1], Myoseon Jang[1], Tara Sabo-Attwood[2], Sarah E. Robinson[2] and Huanhuan Jiang[1]

1. Department of Environmental Engineering Sciences, Engineering School of Sustainable Infrastructure and Environment, University of Florida, Gainesville, FL,32611, USA.

2. Department of Environmental and Global Health, College of Public Health and Health Professions, University of Florida, Gainesville, FL, USA.

Corresponding author: Myoseon Jang, Office: 1-352-846-1744, Fax: 1-352-392-3076, E-mail: mjang@ufl.edu

Abstract

To better characterize biological responses to atmospheric organic aerosols, the efficient delivery of aerosol to *in vitro* lung cells is necessary. In this study, chamber generated secondary organic aerosol (SOA) entered the commercialized exposure chamber (CULTEX® Radial Flow System Compact) where it interfaced with an electrostatic precipitator (ESP) (CULTEX® Electrical Deposition Device) and then deposited on a particle collection plate. This plate contained human lung cells (BEAS-2B) that were cultured on a membrane insert to produce an air-liquid interface (ALI). To augment *in vitro* assessment using the ESP exposure device, the particle dose was predicted for various sampling parameters such as particle size, ESP deposition voltage, and sampling flowrate. The dose model was evaluated against the experimental measured mass of collected airborne particles. The high flowrate used in this study increased aerosol dose but failed to achieve cell stability. For example, RNA in the ALI BEAS-2B cells *in vitro* was stable at 0.15 L/minute but decayed at high flowrates. The ESP device and the resulting model were applied to *in vitro* studies (i.e., viability and IL-8 expression) of toluene SOA using ALI BEAS-2B cells with a flowrate of 0.15 L/minute, and no cellular RNA decay occurred.

Keywords: particle deposition, Air-liquid interface cell, BEAS-2B in vitro cell, Secondary organic aerosol, Electrostatic precipitator

Highlights

- A dose model to predict the delivery of particles to ALI cells *in vitro* using ESP
- Optimal exposure conditions using ESP to obtain the stability of *in vitro* cells
- Application of the ESP device and the dose model to study *in vitro* toxicity of SOA