

**7C.05**

**Active Pharmaceutical Ingredients Released by Dispensing Robots.** DAVID ALBURTY (1), Pamela Murowchick (1), Andrew Page (2), (1) *AlburtyLab, Inc.* (2) *Page Applied Research, LLC*

We conducted a study in U.S. retail pharmacies to assess the potential health risks for pharmacy staff and customers arising from airborne pill dust generated by robotic dispensing machines. Aerosol particle count and mass measurements were taken in pharmacies employing the two most commonly found pharmacy robots (Parata RDS and ScriptPro SP 200) and compared with measurements taken in a pharmacy exclusively filling prescriptions manually.

The study was suggested by the fact that some robots use compressed air and/or vacuum (differential) pressure in the dispensing process. Pill dust can be readily observed on and around these machines and is likely also to be in the air.

The study was begun by taking a sample of dust from a robot that had employed both compressed air and vacuum pressure to dispense prescriptions in a retail pharmacy. The re-aerosolized dust contained a substantial population of nanoparticles (less than 0.5 micron in diameter) and a large mass fraction of particles in the size range less than 2.5 microns (PM-2.5 particles). The dust was analyzed and shown to contain active pharmaceutical compounds.

Subsequently, a screening study of 3 pharmacies was performed to determine test methods for the pharmacies. This was followed by 24-hr sampling at a total of 11 pharmacies. Sampling was conducted using the TSI 3321 APS and replicate quartz fiber reference filters.

Dust samples collected using air filters placed at Parata RDS sites were analyzed using HPLC/MS and were determined to contain hundreds of peaks that could be active pharmaceutical compounds. A limited set of the largest peaks were identified as the active pharmaceutical ingredients acetaminophen, ibuprofen, isosorbide, and trazodone, confirming that aerosols present in those pharmacies were partially composed of pill dust that could be attributed to operation of the robots. Dust samples collected at the pharmacy using the ScriptPro SP 200 and the pharmacy using manual dispensing contained active pharmaceutical ingredients that were attributed to generation during manual dispensing.

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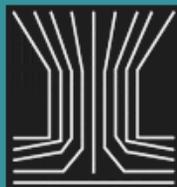
**Examination of Simulated Workplace Aerosols for Nanoparticle Contamination Using Transmission Electron Microscopy.** NANCY JENNERJOHN (1), Arantza Eiguren-Fernandez (2), David C. Fung (1), William Hinds (1), Nola J. Kennedy (1), (1) *Environmental Health Sciences Department, UCLA*, (2) *Center for Occupational and Environmental Health, UCLA*

It is uncertain which characteristics of airborne engineered nanoparticles encountered in workplace air are the best predictors of potential adverse health effects. The objective of this study is to develop a robust collection of transmission electron microscopy (TEM) techniques to measure aerosol properties of engineered nanoparticles. Many aerosol properties can be evaluated using TEM including morphology, crystal structure, surface area, particle size distribution and chemical composition. The ability of air monitoring instruments to correctly report aerosol properties can be evaluated by comparing measured properties to those found using TEM techniques.

A simple versatile electrospray aerosol generator is used to aerosolize single-walled carbon nanotubes and quantum dots. Since those who work with nanoparticles also encounter other airborne pollutants, we aerosolize these nanoparticles with varying amounts of two NIST SRMs, urban dust and diesel particulate matter. Altering the proportion of pollutant to nanomaterial allows the simulation of atmospheres containing nanoparticles and the evaluation of limits of detection of aerosol monitoring instruments and techniques. Numerous TEM images have been obtained. The TEM methods used permit quantitation of engineered nanoparticle concentration among the airborne particulates deposited onto TEM grids. Samples were also taken from two campus research labs, one where carbon nanotubes are in heavy use, and one where quantum dots are synthesized. These two labs serve as test sites for the evaluation of instruments and techniques that may prove efficacious in quantifying worker exposure to airborne nanomaterials in the industrial setting.

There is a long history of using microscopy in occupational health studies. Phase-contrast microscopy (PCM) is used to quantify asbestos exposure, and TEM complements PCM using selected area electron diffraction (SAED) for identification of crystal structure and energy-dispersive x-ray (EDX) for chemical analysis. UCLA is home to several TEMs in its Electron Imaging Center for NanoMachines (EICN) capable of performing SAED and EDX, as well as three-dimensional electron tomography. Progress to date in establishing this TEM performance baseline at the EICN for the evaluation of instrument performance will be reported.

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