

Occupational exposure to aerosolized drugs in residential environments: physical characterization (simulation study)

Yousef Elmashae¹, Sergey A. Grinshpun¹, Tiina Reponen¹, Michael Yermakov¹, Evan Frank¹, Michael Benjamin¹, Andrew Maier¹, Nicholas Newman²

¹Department of Environmental Health, University of Cincinnati

²Cincinnati Children's Hospital Medical Center

Corresponding Author: Sergey A. Grinshpun, PhD at grinshs@ucmail.uc.edu

Purpose: This study aimed at assessing the inhalation aerosol exposure of a home healthcare worker (HCW) treating a patient with aerosolized drugs using a nebulizer. The secondary goal was to determine whether NaCl can serve as a surrogate of aerosolized drugs to be used in future field studies.

Background: Home-attending HCWs may be exposed to a wide range of hazardous aerosols, including pharmaceuticals that they administer to patients. For example, a nebulizer treatment can cause a greater exposure risk as compared to giving the same medication orally or intravenously. Inhalation exposure of home HCWs has not been quantified, and it is not clear if this exposure is significant.

Methods: A two-manikin set-up was designed and built for this study with one manikin simulating a patient and the other simulating a HCW administering a medical nebulizer treatment. Four aerosolized drugs (Ipratropium Bromide, Budesonide, Albuterol Sulfate, and NaCl) were evaluated in individual trials. Each treatment was aerosolized from liquid suspension using a commercially available nebulizer-based aerosol delivery system in a small chamber housed inside a Biosafety Cabinet. Deionized water was used as a control. The aerosol concentration and particle size distribution were measured using an Electrical Low Pressure Impactor at three locations of the HCW-simulating manikin relative to the aerosol source.

Results: The aerosol concentrations were significantly (up to four orders of magnitude, depending on the particle size) higher for each of the four medications compared to deionized water. The total aerosol concentration in the breathing zone exceeded 1 g/m³ in some cases suggesting a potential inhalation exposure risk to a HCW providing the treatment. There were no significant differences between the total mass concentrations of the three selected medications versus NaCl; therefore, NaCl could serve as a surrogate of common nebulizer-administered aerosolized drugs.

Conclusions: The findings of this pilot study suggest that exposure of a HCW to aerosolized drugs may be significant and that NaCl can be used as a surrogate for medications administered by nebulization in future experiments.

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University of Cincinnati 18th Annual Pilot Research Project Symposium October 5-6, 2017



Pilot Research Training Program (PRP) Overview

Welcome to the University of Cincinnati Education and Research Center's (ERC) 18th Annual Pilot Research Project (PRP) Symposium on October 5-6, 2017, held in the Medical Sciences Building Kresge Auditorium. The purpose of the PRP is to increase the research capacity of research trainees and young investigators in occupational health and safety and to encourage those in related disciplines to pursue occupational health and safety research.

Under the administrative direction of Dr. Amit Bhattacharya, research proposals are solicited and peer-reviewed annually by qualifying faculty and graduate students from the University of Cincinnati and the following PRP partnering institutions – Air Force Institute of Technology, Bowling Green State University, University of Toledo – Health Science Campus, Central State University, Purdue University, University of Kentucky, Western Kentucky University, Eastern Kentucky University, Murray State University, Ohio University and Kentucky State University.

At this symposium, the 2016-17 awardees will be presenting the results of their research and the 2017-18 awardees will make poster presentations of their proposed work. The keynote speaker on Thursday, October 5, 2017 is Dr. Carri Casteel from the University of Iowa College of Public Health, presenting on "Public Health Approach to Workplace Violence Prevention in Small Businesses."

The University of Cincinnati's Education and Research Center is one of 18 such centers funded by the National Institute for Occupational Safety and Health (NIOSH) nationally. Dr. Tiina Reponen serves as the director of the ERC, which is based in the University's Department of Environmental Health within the College of Medicine. The purpose of the ERC is to train professionals in the didactic and research skills necessary to lead the occupational safety and health disciplines. Results of research are translated into action through an outreach program and shared with professionals and practitioners in the region via continuing education.

Since 1999, the PRP program has allocated over \$1.3 million to support 230 pilot research projects. These projects have served as a catalyst in bringing over \$39 million in additional research support to the region from sources independent of the PRP program, such as, the National Institute for Occupational Safety and Health (NIOSH), National Institutes of Health (NIH), United States Department of Agriculture (USDA), National Science Foundation (NSF), and the Centers for Disease Control and Prevention (CDC). Additionally, the PRP has brought 51 new investigators from other fields of expertise to the area of occupational safety and health research.

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