NIOSH-Supported
Education and Research Center

14th Annual

2013 Pilot Research Project (PRP) Symposium

October 10—11, 2013
Auditorium, Room 103, Procter Hall
University of Cincinnati Medical Campus
Thursday, October 10th 1:00 pm—5:00 pm
Friday, October 11th 8:00 am—12:00 pm

Keynote Speakers

Wayne T. Sanderson, PhD, CIH
Professor and Chair of Epidemiology,
University of Kentucky
and
Denise L. Smith, PhD
Professor of Health and Exercise Sciences,
Skidmore College, NY

Podium and Poster Presentations by PRP Awardees

Supported by NIOSH grant #T42-OH008432

UNIVERSITY OF Cincinnati

Pilot Research Training Program and Symposium

Welcome to the University of Cincinnati Education and Research Center's (ERC) **14th Annual Pilot Research Project (PRP) Symposium** on October 10-11, 2013**,** held in the Auditorium (Room 103) of Procter Hall, College of Nursing. 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 from 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 – Medical 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 2012-13 awardees will be presenting the results of their research and the 2013-14 awardees will make poster presentations of their proposed work. The keynote speaker on **Thursday, October 10, 2013** is **Wayne T. Sanderson, PhD, CIH,** Professor and Chair of Epidemiology, University of Kentucky and Director, Central Appalachian Regional Education Research Center, who will deliver the keynote address on **"Coal Workers Pneumoconiosis – An Ancient Disease that Is Still among Us." Denise L. Smith, PhD,** Professor of Health and Exercise Sciences at Skidmore College, Saratoga Springs, NY and Research Scientist at the University of Illinois Fire Service Institute, will deliver the keynote address on **"Sudden Cardiac Events: Why Are Firefighters at Risk? "** on **Friday, October 11, 2013.** There will also be opportunities to speak with all of the presenters individually.

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 approximately 1 million dollars to support pilot research projects. These projects have served as a catalyst in bringing over $30 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 also brought 31 new investigators from other fields of expertise to the area of occupational safety and health research.

TABLE OF CONTENTS

Symposium attendees are eligible for:

- ◊ **Eligible for ABIH (IH) CM Points; apply online at http://www.abih.org/**
- ◊ **Meets BCSP criteria for continuation of certification credit**
- ◊ **Approved contact hours: 6.92 Continuing education contact hours for nurses are approved by the Ohio Board of Nursing through the OBN Approver Unit at the University of Cincinnati College of Nursing, Continuing Education Program, (OBN-011-93). Contact hours are valid in most states. Program #131010-1**

The 13th Annual PRP Symposium is free and open to the public.
For more information about the PRP program, please contact
Dr. Amit Bhattacharya, PRP Program Director, at (513) 558-0503
or email Amit.Bhattacharya@uc.edu

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Keynote Speaker, Thursday, October 10, 2013

Wayne T. Sanderson,
PhD, CIH

Professor and Chair of Epidemiology, University of Kentucky and Director, Central Appalachian Regional Education Research Center

Dr. Sanderson is Professor and Chair of the Epidemiology Department in the College of Public Health at the University of Kentucky. Dr. Sanderson has a research focus on occupational and environmental health. He is currently the Director of the Central Appalachian Regional Education Research Center (CARERC) which is one of the 18 ERCs funded by the National Institute for Occupational Safety and Health. He is also Deputy-Director of the Southeast Center for Agricultural Health and Injury Prevention and was formally the Director of the Great Plains Center for Agricultural Health at the University of Iowa. These are Centers for research and education on health and safety problems facing our nation's workers and rural residents. Dr. Sanderson conducts research on respiratory diseases, cancers, and birth defects associated with a wide variety of occupational and environmental exposures. The research projects of his many students cover a very broad range of topics encompassing epidemiology, exposure assessment, and risk assessment components.

Before coming to the University of Kentucky in December 2009, Dr. Sanderson was a Professor in the Occupational and Environmental Health Department of the University of Iowa, College of Public Health. He was the Director of the Industrial Hygiene Training Program for the Heartland Center for Occupational Health and Safety where he taught industrial hygiene and epidemiology courses. From 1978 to 2002, Dr. Sanderson worked for the National Institute for Occupational Safety and Health (NIOSH)—a Center of the Centers for Disease Control and Prevention (CDC)--starting in 1978 and culminating with his position as Chief of the Industrial Hygiene Section in the Industrywide Studies Branch. One of his last assignments with the CDC was as an investigator of anthrax contamination of post offices in Washington, DC.

Keynote Speaker, Friday, October 11, 2013

Denise L. Smith,
PhD

Professor of Health and Exercise Sciences, Skidmore College, Saratoga Springs, NY, and Research Scientist, University of Illinois Fire Service Institute

Dr. Denise Smith completed her PhD in Exercise Physiology from the University of Illinois and is currently a Professor of Health and Exercise Sciences at Skidmore College, where she directs the First Responder Health and Safety Laboratory, and a Research Scientist at the University of Illinois Fire Service Institute. Dr. Smith has coauthored an Exercise Physiology textbook, an Advanced Cardiovascular Exercise Physiology textbook and contributed to a textbook on live fire training. She has conducted far-reaching research on the cardiovascular and thermoregulatory strain associated with firefighting, the effect of fitness and obesity on cardiovascular strain, the physiological burden of personal protective equipment, and the potential use of technology to mitigate the physiological strain of firefighting. Dr. Smith has published over 40 articles in peer-reviewed scientific and medical journals related to the physiological strain of firefighting and the risk of sudden cardiac events in firefighters and she has conducted over a dozen line of duty death investigations related to cardiac events in the Fire Service. She regularly lectures on health and safety issues at Fire Service venues. Her research has been funded by several agencies, including FEMA-AFG, DHS S&T, NIOSH and DOD. She is a fellow of the American College of Sports Medicine and a member of the National Fire Protection Association (NFPA) Fire Service Occupational Safety and Health committee.

PODIUM PRESENTATION SCHEDULE

	Thursday, October 10, 2013		
	Moderator: Emmanuel Iyiegbuniwe, PhD		
Time	**Title**	**Speaker**	**Affiliation**
1—1:15 pm	Welcome	Amit Bhattacharya, PhD, CPE, PRP Program Director	Environmental Health University of Cincinnati
	Introduction of Dean, College of Nursing: Greer L. Glazer, RN, PhD	L. Sue Davis, RN, PhD, Director, Occupational Health Nursing	College of Nursing University of Cincinnati
	Opening Remarks	Greer L. Glazer, RN, PhD, Dean	College of Nursing University of Cincinnati
1:15—1:20 pm	Introduction of Keynote Lecturer: Wayne T. Sanderson, PhD, CIH, Professor and Chair of Epidemiology, College of Public Health, University of Kentucky and Director of the Central Appalachian Regional Education Research Center	Tiina Reponen, PhD, CIAQP, ERC Director	Environmental Health University of Cincinnati
1:20—2:05 pm	Keynote Address: "Coal Workers Pneumoconiosis – An Ancient Disease that Is Still among Us "	Wayne T. Sanderson, PhD, CIH, Professor, Chair	Epidemiology College of Public Health University of Kentucky
2:05—2:15 pm	Keynote Q & A		
2:15—2:35 pm	Light Emitting Diode (LED) Ultra-violet (UV) Disinfection of Water	LeeAnn Racz, PhD, Maj USAF	Systems Engineering and Management Air Force Institute of Technology
2:35—2:55 pm	Encouraging Prevention and Detection Safety Behaviors: Effects of Goal Framing	Steve Jex, PhD for Ashlie Britton	Psychology Bowling Green State University
2:55—3:40 pm	Break (15 minutes) and Poster Session I		3rd Floor Atrium
3:40—4:00 pm	Profiling of Effector Cell Types in Nanoparticle- and Asbestos-exposed Lung	Evan Frank	Environmental Health University of Cincinnati
4:00—4:20 pm	Rapid Neutralization of Organophosphate Nerve Gas Agents	Anthony Arment, PhD for Daqing Gao, PhD	Natural Sciences Central State University
4:20—4:40 pm	In-Vitro Mechanistic Approach to Understand LPS Toxicity in and out of Workplace	Umesh Singh, PhD	Internal Medicine University of Cincinnati
4:40—5:00 pm	Use of Pyrosequencing to Assess Bacterial Diversity in Moisture-damaged Buildings	Eric Kettleson, PhD	Environmental Health University of Cincinnati
5:00 pm	PRP Networking Picnic		3rd Floor Atrium

PODIUM PRESENTATION SCHEDULE

	Friday, October 11, 2013		
	Moderator: Eileen Mason, PhD, CSP, CIH		
Time	**Title**	**Speaker**	**Affiliation**
8:00—8:10 am	**Opening Remarks**	**Amit Bhattacharya, PhD, CPE, PRP Program Director**	**Environmental Health University of Cincinnati**
8:10—8:15 am	**Introduction of Keynote Lecturer: Denise L. Smith, PhD, Professor of Health and Exercise Sciences, Skidmore College, Saratoga Springs, NY and Research Scientist at the University of Illinois Fire Service Institute**	**Amit Bhattacharya, PhD, CPE, PRP Program Director**	**Environmental Health University of Cincinnati**
8:15—9:00 am	**Keynote Address: "Sudden Cardiac Events: Why Are Firefighters at Risk?"**	**Denise L. Smith, PhD, Professor**	**Health and Exercise Sciences, Skidmore College, Saratoga Springs, NY**
9:00—9:10 am	**Keynote Q & A**		
9:10—9:30 am	**Aerosol Contamination at Fire Scenes**	**Barbara Alexander, PhD**	**Environmental Health University of Cincinnati**
9:30—10:30 am	**Break (15 minutes) and Poster Session II**		**3rd Floor Atrium**
10:30—10:50 am	**A Pilot Study: Mechanical Damping and Spine**	**Hiroki Yokota, PhD**	**Biomedical Engineering Indiana University – Purdue University Indianapolis**
10:50—11:10 am	**Assessment of Faceseal Leakage in a Half-mask Respirator Used by Firefighters**	**Sergey Grinshpun, PhD for Xinjian (Kevin) He, PhD**	**Environmental Health University of Cincinnati**
11:10—11:30 am	**An Examination of the Work-Family Interface among Farming Dyads**	**Justin Sprung, PhD**	**Psychology Bowling Green State University**
11:30—11:50 am	**Mobile System for Fatigue Assessment in Firefighters**	**Pooja Kadambi for Fred Beyette, Jr., PhD**	**Electrical Engineering and Computing Systems University of Cincinnati**
11:50—12:00 pm	**Closing Remarks and Program Evaluation**		

PRP POSTER PRESENTATION LIST

No.	Title	Author	University
1	A Hidden Occupational Health Hazard: ETS Among Child Welfare Workers	Shauna P. Acquavita, PhD, LISW-S	School of Social Work University of Cincinnati
2	Flame Retardant Contamination at Fire Scenes	Barbara Alexander, PhD, PE	Environmental Health University of Cincinnati
3	Pyrosequencing as a Tool to Analyze the Mycobiomes in Green-building Materials	Kanistha Chatterjee	Environmental Health University of Cincinnati
4	An Examination of Emotional Labor among Nursing Supervisor-Subordinate Dyads	Yisheng Peng	Psychology Bowling Green State University
5	Give Me a Break: Teacher Recovery Experiences	Kelsey-Jo Ritter	Psychology Bowling Green State University
6	Optimized Jet Impingement Heat Transfer with Reduced Splatter	Sucharitha Rajendran	Mechanical and Materials Engineering University of Cincinnati
7	Use of Pyrosequencing to Assess Fungal Diversity in Moisture-damaged Buildings	Eric Kettleson, PhD	Environmental Health University of Cincinnati
8	System for Transmission of Vital Body Data In Situ for Emergency First Responders	Saibal K. Ghosh	Electrical Engineering and Computing Systems University of Cincinnati
9	Prediction of Core Body Temperature for Firefighters	Anup Paul	Mechanical and Materials Engineering University of Cincinnati

NON-PRP INVITED POSTERS

10	Prediction of Core Body Temperature, Sweat Rate, Cardiac Output and Stroke Volume for Firefighters using a 3D Whole Body Model	Swarup Zachariah	Mechanical and Materials Engineering University of Cincinnati
11	Effects of Heat Stress on Firefighters' Postural Balance During Live Fire Fighting	Kelley James	Environmental Health/ Mechanical Engineering University of Cincinnati
12	Assessing the Protection Factor of Firefighters' Respirators against Combustion Ultrafine Particles	James Dietrich	Environmental Health University of Cincinnati
13	Evaluating the Effect of Heat Stress on Firefighters	Georganne L. Kincer, RN, BSN, COHN-S	College of Nursing University of Cincinnati
14	A Review of Occupational Health and Safety Implications of Exposure and Risk Management of Carbon Nanotubes and Carbon Nanofibers	Usonwanne Nwosu	Public Health Western Kentucky University
15	A Review of Current Regulatory Framework for Nanoparticles	Sireesha Kodali	Public Health Western Kentucky University

2012-13 PRP Awardees
PODIUM PRESENTATION ABSTRACTS

Light Emitting Diode (LED) Ultra-violet (UV) Disinfection of Water

LeeAnn Racz (PI), Michael Miller

Systems Engineering and Management
Air Force Institute of Technology

Purpose: This project evaluated the effectiveness of pulsed gallium nitride (GaN) light emitting diode (LED) ultraviolet (UV) lamps to disinfect drinking water.

Design: This project employed a novel configuration of an array of LED lamps which can be immersed in water. In addition to applying a continuous current to the LEDs, this project applied pulsed current to the LEDs in order to reduce the power requirements of such a water disinfection device as well as extend the life of the LED lamps.

Methods: A reactor was built in which the LEDs were in contact with water infected with *Bacillus subtilis* spores was pumped through. Both the influent and effluent spore solutions were cultured on agar plates in order to determine the disinfection effectiveness of the reactor.

Results: The continuous wave configuration at 600 J/m^2 and 104 minute residence time consistently inactivated the spores. The influent spore solution (positive control) yielded visible colony forming units when plated, whereas the effluent did not yield bacterial growth on agar plates.

Conclusion: The continuous wave configuration successfully disinfected the water. Future experiments will continue in order to evaluate the effectiveness of the pulsed configuration.

Impact: This project will give important insight into understanding the feasibility of using UV LEDs in disinfecting water. In addition, the experiments using the pulsed configuration will reveal the effectiveness of that configuration in water disinfection as well as whether it will extend the life of the LEDs.

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Encouraging Prevention and Detection Safety Behaviors: Effects of Goal Framing

Ashlie Britton (PI), Steve Jex

Department of Psychology
Bowling Green State University

Purpose: The purpose of the current study was to investigate the effectiveness of gain- and loss-framed messages for the encouragement of prevention and detection safety behaviors. Based on findings regarding the promotion of health behaviors, it was expected that gain-framed messages would be more effective at encouraging prevention safety behaviors and loss-

framed messages would be more effective at encouraging detection safety behaviors.

Design: This was tested with a two-time point experimental design in which participants were randomly assigned to receive one of six messages [2 (promoted behavior: prevention, detection) X 3 (message frame: gain, loss, neutral)].

Method: The participants for this study were employees from the manufacturing, construction, and mining industries. The hypotheses were tested by presenting participants with safety promotional messages of a certain frame, encouraging a specific type of behavior and then measuring their behavioral intent, attitudes toward the behaviors, and perceived efficacy regarding the behaviors. Data was collected at a two time points in order to examine if the promotional messages had lasting effects.

Results: While the majority of findings were non-significant, there was some evidence that messages can be used to influence behavioral intentions, attitudes, and perceived efficacy. In addition, results indicated that the gain-framed message was more effective at encouraging the detection behaviors, contrary to expectations.

Conclusion: It is possible to influence safety behavioral intentions and attitudes using promotional messages and there is some evidence that gain-framed messages may be most effective, regardless of the type of behavior being promoted. More research is needed, however, with the use of stronger manipulations, more experimental realism, and possibly more severe safety threats as the target.

Impact: The current study was the first to examine the effects of goal framing for the encouragement of prevention and detection safety behaviors. As such, the current study offers significant contributions to the area of occupational safety and health. The major theoretical implication of the current study is that safety promoting messages have the potential to impact employee beliefs, attitudes, and intentions regarding safety behaviors. This is especially important given evidence that safety beliefs and attitudes have been found to predict safety behavior intentions which in turn predict actual safety behaviors (Quick et al., 2008). This is consistent with the Health Belief Model and the EPPM. According to the Health Belief Model (Rosenstock, 1974) and the EPPM (Murray-Johnson, 2004), it was expected that safety messages would impact participants likelihood to engage in safety behaviors by influencing the extent to which they recognize that they are personally susceptible to some harm and that they can take steps to protect themselves by engaging in the promoted behavior. Consistent with past research (e.g. Quick et al., 2008; Stephenson et al., 2005), the current study provided some evidence that safety promotional messages, aimed at influencing safety attitudes and motivation for a specific type of behavior, are capable of impacting safety behavioral intent, attitudes, and perceived efficacy for those behaviors. Specifically, the significant interaction, although not in the expected direction, still provides evidence that messages can influence behavioral intentions.

In terms of how goal framing impacts the effectiveness of safety promotional messages, findings from the current study are inconsistent with the theory of regulatory focus and regulatory fit. That is, although there was some evidence that goal framing may impact behavioral intent, attitudes, and efficacy, the results were in the opposite direction of that hypothesized. According to regulatory focus (Higgins, 1997), it was expected that gain-framed messages would be more effective at promoting prevention behaviors and that loss-framed messages would be more effective at promoting detection behaviors, but this was not found in the current study. The implications this holds for theory is essentially that more work is needed to determine how goal-framing can be used in promoting safety behaviors in the workplace.

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Profiling of Effector Cell Types in Nanoparticle- and Asbestos-exposed Lung

Evan Frank (PI), Eileen Birch, Vinicius Carreira, and Jagjit S Yadav

Department of Environmental Health
University of Cincinnati

Purpose: Identify cell type-specific effector mechanisms in lung associated with exposure to multi-wall carbon nanotubes (CNTs) and crocidolite asbestos which may mediate chronic inflammation and fibrosis in a mouse model of exposure.

Design: Compare and contrast the phenotypes of specific proposed effector cell types induced by exposures to CNTs, an emerging nanoparticle lung toxicant, and asbestos, a known particle lung toxicant. Parallel subchronic exposure models were established with each material and samples were analyzed for correlations between resulting pathologies and effector cell profiles in light of existing literature.

Methods: For either toxicant (CNT or asbestos), two groups of animals were exposed in an 8-week exposure model. In the first group, lungs were fixed, processed, and stained for evaluation of histopathology and fibrosis. In the second group, lungs were digested to single-cell suspensions and proposed effector cell types were isolated based on surface markers. RNA from isolated cells was used for gene expression analysis by quantitative real-time PCR. Differences and similarities in expression profiles were examined across a multitude of target genes including immunological mediators and homeostatic markers.

Results: CNT and asbestos exposures were associated with different predominant lesions in the lung, while both exposures caused fibrosis. Isolated cell types, which included antigen-presenting cells (dendritic cells and macrophages), alveolar epithelial cells, and T-lymphocytes, exhibited differing levels of expression of selected chemokines and cytokines. CNT exposures resulted in higher expression of proinflammatory mediators including *Cxcl5* and *IL-1b*, consistent with pathological observations. Furthermore, results suggested that different paradigms of immune activation in resident cell types are induced by the two exposures. This and other phenotypic differences are discussed.

Conclusion: CNT and asbestos exposures induce overlapping but distinct profiles of gene expression in individual effector cell types which can be correlated to similarly overlapping, but distinct, presentations of chronic inflammation and fibrosis in the exposed lung. This work produced a dataset on gene expression profiles in several distinct cellular compartments and generated promising hypotheses on the underlying mechanisms of these occupational lung pathologies to be tested in further studies by our laboratory.

Impact: While CNTs and asbestos are understood to have potentially deleterious effects in the lung, the underlying cellular and molecular mechanisms are unknown. Several studies have attempted to delve into these mechanisms with varying success. This study uses a cell-type specific screening approach which will further understanding in the basic science of fiber-related lung disease and aid in the application of treatment strategies for these occupational health issues.

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Rapid Neutralization of Organophosphate Nerve Gas Agents

Daqing Gao (PI) & Anthony R. Arment

Department of Natural Sciences
Central State University

Purpose: The purpose of this project was to use the organophosphate (OP) malathion as a simulant molecule to identify organisms able to degrade the chemical warfare agent VX and its hydrolysis products EMPA and DESH (DIEM). The application of this project will be in finding better ways to protect first responders and anyone exposed to OP nerve agents as well as to protect our wastewater and drinking water systems.

Design: Cultures were identified from chronically contaminated greenhouse soil and from activated wastewater sludge based upon their ability to grow using malathion as a source of carbon and phosphorus, carbon, or sulfur. Malathion selected clones were tested for their ability to utilize VX hydrolysis products.

Methods: Cultures were isolated from minimal medias and subjected to identification by 16S ribotyping. GC -MS was utilized to quantify malathion usage in the best degraders. Transposon libraries were constructed to knockout utilization genes for identification. Cosmid libraries were constructed and screened for phenotype conversion using malathion as a nutrient source.

Results: Seventy-five organisms were identified and screened for their ability to degrade malathion, EMPA and DIEM (DESH). Transposon libraries have identified genes necessary for malathion and EMPA usage by loss of function. The identification of the genes is ongoing. Cosmid libraries have identified regions of DNA that allow *E. coli* to grow on malathion and EMPA as sole sources of phosphorus.

Conclusion: The organisms themselves have potential roles to play through their addition to wastewater treatment systems and or contaminated surface sites for cleanup. However, the slow growth rate of the most active degraders may be prohibitive. The generated library of organisms holds enzymes of potential usage in degrading OP nerve agents in the field. Work is ongoing to clone and express the genes into *E. coli* for further study.

Impact: Chemical warfare agents, particularly organophosphate nerve agents, have been used in warfare and terrorist activities since World War II. Past examples include the 1994 Aum Shinrikyo cult attack on the Tokyo subway using Sarin gas and the exposure of United States troops to nerve agents during the Gulf War. The possible usage of OP nerve agent in Syria reemphasizes the need for better protection and neutralization systems. Fast acting and environmentally safe methods for the neutralization of these compounds are of importance to our military and law enforcement agencies, first responders, health professionals and civilians.

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Endotoxin Exposures in Size-specific Particles in and out of the Workplace: An in Vitro Study

Umesh Singh[1](PI), Jonathan A. Bernstein[1,2,3], Atin Adhikari[4]

[1]University of Cincinnati, UC Physicians
[2]Division of Immunology Allergy & Rheumatology, University of Cincinnati
[3]Bernstein Allergy Group, Cincinnati, OH
[4] Department of Environmental Health, University Of Cincinnati

Purpose: To characterize inflammatory responses and as a result the nitrative stresses in human bronchoepithelial cells (BEAS 2B) upon exposures to endotoxin in airborne particles of aerodynamic diameter (da) <1.0 mm and >1.8 mm.

Design: In an in vitro study BEAS-2B cells were exposed to endotoxin extracts either from airborne particles

with d_a<1.0 mm or from particles with d_a>1.8 mm. Thereafter, differential induction of nitrative stress and expression of genes regulating inflammatory pathway were determined in these cells.

Methods: Size-specific airborne particles (d_a<1.0 and >1.8 mm) were collected using bio-aerosol cyclone sampler. Endotoxin in these particles were extracted and then quantified using Limulus Amebocyte Assays (LAL). BEAS-2B cells grown on glass cover slips were loaded with nitrative stress indicator (DAF-FM) that would fluoresce higher when bound to nitric oxide (NO). Nitrative stresses upon exposures to endotoxin extracts from size-specific particles at similar concentrations were then detected by comparing post-exposure fluorescence (F) with baseline fluorescence (F_0). Using real-time PCR relative over-expression or down-regulation of genes regulating human inflammatory pathways were also determined in these cells with similar exposures.

Results: BEAS-2B cells exposed to endotoxin in particles with da>1.8 mm demonstrated higher nitrative stresses. Cells exposed to endotoxin in particles <1.0 mm over-expressed anti-inflammatory genes and had down-regulation of pro-inflammatory genes.

Conclusion: Exposures to endotoxin in airborne particles with d_a>1.8 μm may induce inflammation more than those in particles d_a<1.0 mm by over-expressing inflammatory genes in airway epithelial cells.

Impact: Differential cellular stress response, cytokine overexpression or receptor up-regulation on exposures to endotoxin in size-specific particles were unknown before. Therefore, this study suggests newer approaches towards environmental monitoring for workers in health-care settings, zoos or farms where exposures through endotoxin in size-specific particles would be a significant concern.

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Use of Pyrosequencing to Assess Bacterial Diversity in Moisture-damaged Buildings

Eric Kettleson[1] (PI), Stephen Vesper[2], Atin Adhikari[1]

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[2]United States Environmental Protection Agency, Cincinnati, OH

Purpose: Bacteria coexist in moisture-damaged building materials with fungi and could contribute to the adverse health outcomes associated with exposure. However, much less information is available on the bacterial communities in moisture damage buildings compared to that of mold. The primary purpose of this project was to investigate how bacterial diversity differs between moisture-damaged buildings and undamaged reference buildings using pyrosequencing. The results are expected to lead to improved early prediction and cost-effective testing of microbial contamination in buildings and could lead to a better understanding of the association between building moisture damage and respiratory symptoms, particularly which bacterial species might contribute to these respiratory symptoms.

Design: The study was a cross-sectional study of 42 homes in the Cincinnati area. The homes were divided into "moisture-damaged" and "non-moisture-damaged" groups based on their average Environmental Relative Moldiness Index value calculated from two consecutive years of sampling.

Methods: House dust was collected by floor vacuuming from the living room. DNA extracts from the dust underwent 454 pyrosequencing using the 28F-519R bacterial assay, which covers the variable regions V1-V3 on the 16s rRNA gene. Sequence files were queried against a database of high quality bacterial sequences with a BLASTN+ search program and classified at the appropriate taxonomic levels based on identity scores.

Results: Linear discriminant analysis effect size analysis identified 99 taxa that were enriched in either the

moisture-damaged or non-moisture-damaged groups. Of these taxa, 55 of them corresponded to the high-ERMI (moisture-damaged) condition. Most significantly enriched taxa in the high-ERMI condition include unnamed species of the *Massilia*, *Arthrobacter*, *Bacteroides* genera (LDA scores > 3.0). For the low-ERMI condition, the *Streptococcus* and *Neisseria* genera were most significantly enriched (LDA scores < -3.0). Alpha and beta diversity was not significantly different between the two environments.

Conclusions: The *Massilia* and *Arthrobacter* genera are representative of bacteria that are often found in soil and other environmental samples. Bacteroides makes up a substantial portion of the gastrointestinal flora in mammals. Moisture intrusion events could have actively trafficked these bacteria inside the home through roof and/or foundation leaks, and in the case of *Bacteroides*, through sewer back-ups in the lower level of the homes during heavy rainfall. The data generated in this pilot study, combined with further research, could provide the incentive to develop or refine PCR assays as a means for a targeted approach for improved early prediction and cost-effective testing of indoor microbial contamination and assessing the impact of bacterial diversity on occupants' health.

Impact: Next-generation sequencing technology is an improvement in the methodology for characterizing the indoor microbiome of moisture-damaged buildings. The information derived may present a new approach to analysis of significant bacterial flora differences between non-damaged and water-damaged buildings. Accordingly, the results may well demonstrate significant potential to move the environmental microbial assay field forward.

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Aerosol Contamination at Fire Scenes

Barbara M. Alexander (PI)

Department of Environmental Health
University of Cincinnati

Purpose: The purpose of this research was to study potential sources of firefighter exposure to hazardous chemicals during fire response. It has been recognized that firefighters suffer high rates of adverse health outcomes such as cancer and coronary heart disease. Chemical exposures are believed to be an important factor in the development of these conditions.

Design: Four air samples were collected during the overhaul phase of residential fires. In addition, samples of unused and used firefighter protective clothing were analyzed, to further quantify potential firefighter exposures to chemicals.

Methods: Firefighters were trained to collect air samples during the overhaul phase of firefighting. Unused and used samples of firefighter protective clothing were also analyzed for contamination with specified chemical agents.

Results: In air samples obtained during fire overhaul at residential fires, no di-(2-ethylhexyl) phthalate (DEHP) was found above the level of detection. Analysis of firefighter gloves and hoods for polybrominated diphenyl ether (PBDE) flame retardants showed that these chemicals were present in unused firefighter gloves, and in used gloves, hoods and a cuff from a turnout coat. These contaminants were present in addition to high levels of DEHP previously found on the same and similar used clothing samples.

Conclusion: The presence of PBDEs on all 3 layers of an unused firefighter glove shows that the fabrics have been treated with flame retardant chemicals. These chemicals could have harmful effects on firefighter health. Higher levels of several PBDEs were also detected on a soiled, used firefighter hood and coat cuff. The levels were far lower than those of DEHP, however. DEHP levels in firefighters' blood

and urine should therefore be studied. The dermal absorption route of exposure to contaminants such as DEHP and PBDEs should also be investigated.

Impact: Chemical exposures may be partly responsible for firefighters' high rates of adverse health outcomes such as coronary heart disease and cancer. This research suggests that firefighters may be exposed to DEHP and PBDE flame retardants at levels much higher than the general population.

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A Pilot Project: Mechanical Damping and the Spine

Todd Dodge[1], Mina Wanis[1], Hiroki Yokota[1, 2] (PI), Liming Zhao[1]

[1]Department of Biomedical Engineering, Indiana University - Purdue University Indianapolis
[2]Department of Anatomy and Cell Biology, Indiana University School of Medicine

Purpose: A knee loading modality is reported to stimulate bone formation in the loaded tibia and femur, but its potential effect on a bone remote to the loaded bone has not been examined. A question addressed herein was: does knee loading strengthen mechanical properties of trabecular bone in the spine?

Design: Using ovariectomized (OVX) and sham OVX control mice, knee loading was applied daily for 4 weeks. Administration of salubrinal was employed as a positive control for systemic effects.

Methods: Mechanical properties of L5 vertebral body was characterized, focusing on stiffness (Young's modulus), damping (dissipation energy), and fracture behaviors (yield and ultimate strengths).

Results: The results showed that knee loading increased Young's modulus of the L5 vertebral body of OVX mice by 80% as compared to sham loaded controls. Knee loading reduced dissipation energy by 40-45%, in which bone contributed a significant portion (50-70%) to the damping capacity of the spine in a frequency dependent manner. In a compressive failure test, OVX animals treated with knee loading exhibited an increase in yield strength (60%) and ultimate strength (33%).

Conclusion: Collectively, both knee loading and administration of salubrinal increased stiffness and strength, and decreased damping of trabecular bone in the L5 vertebral body. The results provide supporting evidence that knee loading is capable of inducing loading effects in not only the loaded but also non-loaded bones.

Impact: Back pain is a major problem in the Occupational Safety and Health field. This pilot project contributes to our basic understanding of the role of mechanical loading to the spine.

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Assessment of Faceseal Leakage in a Half-mask Respirator Used by Firefighters

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Purpose: To evaluate the fitting characteristics of an elastomeric half-mask respirator worn by a 25-subject panel being fit-tested while exposed to a NaCl-based surrogate of the combustion aerosol.

Design & Methods: Twenty-five adult subjects representing a NIOSH bivariate panel were tested with an elastomeric half-mask respirator while participating in a standard OSHA fit testing protocol. NaCl parti-

cles were generated as the challenge aerosol and the concentrations inside and outside of the respirator were measured to determine the fit factor for each subject. Additional tests were performed with one subject under challenge facial conditions, including wet and/or unshaved face.

Results: The respirator produced a geometric mean (GM) fit factor of 7,907 with a geometric standard deviation (GSD) of 4.9. The challenge condition wet-shaved face was associated with higher fit factor (GM = 267) than that (GM = 74) of dry-shaved face. No significant different was found between other challenge conditions.

Conclusion: The elastomeric half-mask respirator was found to provide adequate passing rate (96%) for a 25-subject panel.

Impact: The valuable scientific data generated in this study will help the respirator manufacturers recognize the impact of the faceseal leakage on the total penetration, so they will focus their efforts on designing better fitting respirators that will eliminate or minimize the faceseal leakage. These improved respirators will not only benefit firefighters but also other workers since half-mask respirators are used widely in various occupational environments.

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An Examination of the Work-Family Interface among Farming Dyads

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Purpose: The purpose of this study was to advance the contextualization of the work-family interface by 1) examining the prevalence of positive and negative work-family interactions among farmers, 2) examining positive spillover (individual) and crossover (dyadic) work-family processes among farm couples, and 3) exploring a potential moderator of the positive crossover process.

Design: A cross-sectional survey design was used. Farmers, as they have a unique work-family dynamic, were used as the target sample for the current study

Methods: A total of 217 farm couples were recruited from a major farming Midwestern state. Participants were asked to complete separate online surveys containing various measures of work-family and health-related variables. Couples received a monetary incentive for participation.

Results: Husbands and wives reported more work-family facilitation than conflict. Regarding individual spillover, multiple positive spillover effects were found for both husbands and wives. Additionally, direct crossover effects revealed that individual attitudes (husbands' work engagement and wives' farm satisfaction) were related to partners' reported work-family facilitation. Furthermore, husbands' work-family facilitation was positively related to wives' psychological wellbeing, while wives' work-family facilitation was not significantly related to husbands' psychological wellbeing. Spouse support moderated the crossover process for wives only.

Conclusions: Overall, similar to previous work-family research, positive attitudes stemming from the work domain were related to individual family experiences and general wellbeing, as well as the work-family experiences and wellbeing of his/her partner. Moreover, findings suggest the potential beneficial impact of the integrated work-family dynamic associated with the farming profession. Additionally, spouse support seems to play a role in the positive crossover process among wives. Future research should further examine farmers, as

well as other understudied occupations to fully understand the contextualization of the work-family interface.

Impact: First of all, farmers are relatively neglected in psychological and occupational research outside the realm of safety issues (Bentley, 1994). Furthermore, specifically regarding occupational health research concerning work-family issues, the primary focus, to date, has been on white-collar, professional occupations (Casper et al., 2007). Additionally, there has been an emphasis on contextualization of the work-family interface, as work-family experiences differ depending on one's specific occupational and family situation (Kossek, Baltes, & Matthews, 2011). Similarly, Zickar (2010) has called for increased investigation of humanistic concerns and understudied populations. Finally, the focus on the individual with little attention to dyadic relations, as well as the focus on WFC as opposed to WFF, has been cited as a criticism within work-family research (Hammer, et al., 2002; Hammer & Zimmerman, 2011). The current study advanced previous work-family research by examining a novel, dyadic population's experience of positive work-family experiences.

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Mobile System for Fatigue Assessment in Firefighters

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Purpose: The purpose of this project is to develop a portable EEG data collection/analysis system capable of assessing the wearer's level of fatigue. Such a system would be useful for job safety monitoring in a number profession including firefighters, military personnel, law enforcement, first responders, long haul truck drivers, pilots, flight controllers and construction workers.

Design: The proposed technology uses the well documented Event Related Potentials (ERP) response as a basis for assessing user fatigue. Essentially, the EEG hardware measures brainwave activity associated with the neuronal response to either visual or auditory stimulus. The primary hypothesis that underlies the proposed technology is that fatigue produces measurable changes in the ERP response. The experimental design used to validate this hypothesis involves evaluating a small group of healthy young-adult volunteers using a standard set of EEG ERP tests under various physical states including:
1) normal rested condition, 2) after physical exertion, 3) after sleep depravation and 4) after stimulant (caffeine) ingestion. The timing, magnitude and temporal spread of the ERP response are analyzed for potential use as indicators of user fatigue. In addition to substantiating the primary hypothesis, this study also allows us to determine the minimum number of electrodes and their optimal positioning for capture of EEG ERP. This information is critical for development of a portable EEG capture system specifically designed for assessment of fatigue in firefighters.

Methods: This project uses standard EEG testing methodologies and standard electronic hardware and software design processes for 1) evaluating the suitability of EEG ERP as an indicator of fatigue and 2) designing and implementing the hardware and software of the proposed system. Test subjects used in this study were limited to students and lab mates who were working on the development of the EEG technologies. Since the work is very early stage device development, there has been no attempt made to use test subjects from the intended user groups (i.e., firefighters) or working conditions associated with fire fighting. Rather, the focus of this research has been to develop a functioning prototype that could be subsequently used in follow-on studies.

Results: First, through use of a research grade EEG system, we have demonstrated that physical exertion and sleep deprivation both produce a delay in ERP response. Further, we have shown that this temporal shift in ERP response is seen for both visual and auditory stimuli. This result is consistent with expectation (i.e. the brain response becomes sluggish with either physical exertion or sleep deprivation). Second, we have shown

that the delay in ERP response can be somewhat offset by ingesting caffeine in the form of either coffee or energy drinks. While the ERP response after caffeine consumption is shifted towards normal, the magnitude of the shift was insufficient to restore normal ERP signal timing for typical serving sizes of caffeinated drink.

While the performance of the ERP classification algorithm is improved by increasing the number of electrodes, it was found from this study that 4-8 electrodes positioned on the anterior skull region is usually sufficient to produce repeatable results with high accuracy.

Based on this conclusion a hardware platform capable of capturing, digitizing and wirelessly transmitting up to 8 electrodes of data was designed and tested first using demonstration boards with the selected hardware components and then with a fully custom printed circuit board design. The demonstration board system, allowed us to demonstrate functional equivalence between the proposed hardware and the research grade bench top system. The fully custom printed circuit board design is currently being evaluated.

Conclusion: This study has shown that EEG can be used to assess fatigue as modeled with physical excursion and sleep deprivation. Further, the initial concept testing has given valuable insight to the implementation configuration needed to make a portable EEG system for fatigue monitoring. Initial testing of the prototype hardware confirms performance equivalent to a research grade bench top EEG system. Work to implement a fully custom printed circuit board design of the portable EEG system is ongoing.

Impact: As described above, the results of this 12-month study prove that EEG/ERP can be used as a basis for fatigue assessment. This conclusion lays the foundation for the development of a portable EEG/ERP capture and analysis system that could be deployed to assess fatigue in firefighters and other workers for whom fatigue can be a serious workplace hazard.

In addition to substantiating the primary hypothesis, results from the EEG/ERP testing have given critical information needed to guide the development of a first generation portable system for doing ERP measurements in the workplace environment. It is anticipated that the prototype currently being tested in the lab will have the battery lifetime, wireless communication and ease of use to enable real world evaluation of the technology concept. Further, it is anticipated that the this first generation prototype will lay the ground work necessary for incorporating the technology into the firefighters personal protective gear.

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2012-13 PRP Awardees
POSTER PRESENTATION ABSTRACTS

An Occupational Health Hazard: ETS among Child Welfare Workers

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NORA Healthcare and Social Assistance Sector Council's third strategic goal is to "Reduce or eliminate exposure and adverse health effects caused by hazardous drugs and other chemicals" (2009, p.13). Environmental Tobacco Smoke (ETS), also known as secondhand smoke, consists of smoke emanating from the burnt ends of a cigarette and smoke exhaled by the active smoker (CDC, 2011). ETS has been linked to such health issues as cancer, heart disease, and fertility issues. Child welfare workers, categorized under subsector Social Assistance for NORA, are exposed to ETS as they visit clients in the home and there are no ETS regulations in private homes. ETS s one of the most common occupational health hazards child welfare workers face, yet, no studies have been conducted regarding ETS exposure among this population. The specific aims of this project are to 1. Define exposure to ETS among child welfare workers. 2. Measure child welfare workers' attitudes, knowledge, and willingness to provide counseling and education on ETS and tobacco use. 3. Characterize self-reported ETS policies for home and automobile, smoking behavior and current tobacco consumption among child welfare workers. This study will utlize two designs. One, a crossectional survey of 300 child welfare workers and a observational cohort design using 180 non-smoking child welfare workers. All participants are employed at Ohio Department of Job and Family Services in Hamilton County, Ohio. This data will serve as rationale in a future grant application, which will aim to develop an educational and behavioral intervention for staff in child welfare to 1) reduce exposure to ETS and 2) provide support and education for staff to effectively deliver tobacco cessation services.

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Flame Retardant Contamination at Fire Scenes

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High levels of several flame retardant chemicals have recently been found in household dust. Some of the polybrominated diphenyl ether (PBDE) flame retardants used earlier have been phased out due to the fact that they have been found widely dispersed in the environment, they bioaccumulate in human tissue, and they exhibit toxicity. Replacement flame retardants, such as the mixture known as Firemaster 550, may have some of the same drawbacks. Flame retardants are generally not chemically bound to the plastics, foam rubber and electronic components that they protect, and are easily dispersed from the matrix.

Due to the widespread presence of banned as well as current flame retardants in house dust, there is concern that firefighters may be exposed to these chemicals at fire scenes. Because these compounds are so stable, they may be left intact when the matrix in which they were dispersed is burned. This would put firefighters at greater risk of exposure than the general public. During my previous research, large quantities of di-(2-ethylhexyl) phthalate (DEHP), a plastic additive, were found contaminating used firefighter gloves, hoods

and jackets. Samples from these protective clothing items will be analyzed to determine whether they are also contaminated with flame retardants.

Flame retardant chemicals are lipophilic and are known to accumulate in fatty tissue. Due to the Iipophilicity of the chemicals, if firefighter protective clothing is contaminated with them, the chemicals may be absorbed through the skin, especially at the high temperatures encountered during firefighting.

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Pyrosequencing as a Tool to Analyze the Mycobiomes in Green-building Materials

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Environmental concerns for improved energy consumption and reduced carbon emissions are driving a green building/remodeling movement resulting in tighter buildings and poor indoor air quality. Recently, more and more office buildings are being constructed using green-building materials in order to become energy-efficient. Building-related symptoms (BRS) amongst office workers have been attributed to poor indoor air quality in modern energy-efficient buildings. Furthermore, there has been a causal relationship established between fungal exposures and BRS amongst office workers. The potential harmfulness of fungal contamination is dependent on the species content and the material in which the fungi proliferate. Fungi are major colonizers of building materials. The aim of the proposed study is to investigate the difference in fungal diversity in green -building materials as compared to non-green building materials, using pyrosequencing. Pyrosequencing is a cost- and time-effective DNA sequencing technique that has been used for evaluating microbial diversities in various environments. This technique is based on the detection of released pyrophosphate (PPi) during DNA synthesis. The expected results will lead to a better understanding between fungal diversity in green- and non-green building materials. This will be the first study to use pyrosequencing in order to investigate the relationship between fungal communities and green building materials.

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An Examination of Emotional Labor Among Nursing Supervisor-Subordinate Dyads

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Though emotional labor has become an increasingly important topic within organizational psychology, past research has mainly focused on intrapersonal mechanisms in the mind and the body of individuals who regulate their emotions during their interactions with important others, such as clients, coworkers, and supervisors. More current research emphasizes social interaction contexts of emotional labor and grounds the primary goal of this research--to examine emotional labor in supervisor-subordinate dyads.

This project seeks to examine emotional labor in an interpersonal interaction context by examining how surface-and deep-acting exhibit different effects on employee outcomes in nursing supervisor-subordinate dyads. Due to the physical and mental proximity of subordinates and supervisors, it is likely that crossover (attitudes flowing from one person to another) effects of emotional labor exist. Additionally, the multiple di-

rections (from subordinates to supervisors and vice versus) and the nature (surface versus deep acting) of emotional labor crossover effects will be investigated to determine whether their prevalence in such a social interaction context extends into perceptions of work strain, well-being, as well as social support.

Finally, supervisor social support will be examined to determine if it may mediate the relation between emotional labor and work strain, as well as occupational well-being. Social support is usually regarded as an important buffering factor in the work strain area; however, few studies have explored its mediating effect, let alone examined the role of emotional labor in the giving-receiving of social support relationships.

A dyadic design will be used to examine emotional labor among nursing supervisors and nurses within a major hospital from a major U.S. city. This study will survey consenting hospital nurses by valid measures on emotional labor and employee outcomes. Proposed hypotheses will be tested through the data in this project.

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Give Me a Break: Teacher Recovery Experiences

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National and international data points to teaching as a very stressful occupation with a high rate of burnout, especially amid recent cuts to education at a national and state level. Teacher stress and turnover cost over $7.3 billion a year and are associated with other negative consequences such as decreased well-being and health. This seeks to better quantify and understand sources of stress that teachers experience while simultaneously offering strategies for enhancing their well-being that can be implemented both at the individual and school level.

This study seeks to demonstrate that the type and duration of breaks that teachers engage in during the school day and at home have important implications for their health, teacher self-efficacy, and work engagement. Further, teacher absence (often due to stress related illness or need for recovery) has been shown to disrupt continuous classroom instruction and event, or may impair students' ability to develop consistent, comfortable student-teacher relationships with substitutes.

This study will utilize a longitudinal, daily-diary method design that has been shown to capture important within-person fluctuations in stressor-strain relationships. Participants will complete a general baseline survey during Phase I of the study. Phase II will consist of six consecutive days of data collection in which participants will complete an online survey at the beginning and ending of each day. It is expected that the time and activities that teachers engage in during their breaks at work and home will be significantly related to indicators of well-being, as well as teacher self-efficacy and work engagement.

Data will be examined to determine important within-person and between-person differences.

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Optimized Jet Impingement Heat Transfer with Reduced Splatter

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Understanding and being able to manipulate the drop distribution emerging from an impinging jet splattering on a heated surface finds many practical applications. When cutting fluid hits the heated site of a surface being machined, the drops sprayed would be subjected to sudden evaporation. The resultant mist could be inhaled by the workers in the vicinity and is harmful. The goal of the proposed research is to investigate the formation of droplets and aim at creating a model that accounts for fluid properties, nozzle geometry, angle of incidence and the ambient conditions. This will help minimize the splatter during jet impingement process and provide an optimum working condition without compromising on providing cooling at the machining site. The model developed can be of use in other industries such as fertilizer treatment, spray coating and in annealing of metals, where, if the drop sizes are too small, probability of spray and contact is more. An experimental set-up consisting of jet impinging on a surface maintained at a constant heat flux will be used. The flow rate of the jet can be controlled using a pressure regulator and flow control valves. Infra Red camera placed at an appropriate location near the heated surface will help gauge the effectiveness of cooling by jet impingement. A high speed digital camera will be used to capture the drop distribution and splatter. Numerical modeling of the same phenomena will be done on OpenFOAM. The experimental results will aid in perfecting the numerical model which will be used to study the influence of ambient conditions. This will then enable us to modify the test parameters and see its effect on drop distribution and cooling efficiency. The model thus developed, can then be integrated with the research on drop spreading and phase change on impact with a heated surface done in our laboratory. A consolidation of these two, will then help us see the generation and spreading of mist on jet impingement. The model thus developed can then be used to optimize the effects of jet impingement based on the application which could range from pesticide control to drug delivery. Finally, we hope to provide a means to reduce splatter and contact on the operators present.

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Use of Pyrosequencing to Assess Fungal Diversity in Moisture-damaged Buildings

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Poor respiratory health outcomes can result from prolonged exposure to damp environments in a number of settings including industrial workplaces, agricultural workplaces, and living spaces. Damp spaces provide an excellent environment for mold growth as evidenced by a strong correlation between moisture-damage and contamination of specific species of molds. Respiratory ailments, including allergy and asthma, can result from the release of mycotoxins, spores, and hyphal fragments of molds. A new perspective on indoor microbial exposure is evolving via application of high-throughput DNA sequencing methods that aims to more objectively and comprehensively characterize these exposures in terms of diversity metrics. The aim of the pro-

posed work is to investigate how fungal diversity differs between moisture-damaged buildings and undamaged reference buildings by analyzing archived dust samples collected from buildings in the Cincinnati area. The use of the culture-independent pyrosequencing method is expected to indentify individual major genera and species of fungi specifically associated with moisture-damaged buildings that might normally be missed by culture-based methods. The proposed study is expected to lead to a better understanding of the association between building moisture damage and fungal diversity. In turn, this should lay the foundation for future work that would investigate how changes in the indoor environment (including ventilation rates, humidity levels, etc.) qualitatively and quantitatively affect these communities which could subsequently influence design recommendations.

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System for Transmission of Vital Body Data in situ for Emergency First Responders

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Enabling the transmission of firefighter's heart rate and body temperature values to the fire chief to aid in the marshalling of firefighters in a disaster scenario is the prime objective of this research. Heart rate and body temperature have a bearing on an individual's general health and thus have an impact on their ability to perform their duty. Our research involves using small low-powered sensors worn on the clothing of the firefighters that can be used to transmit this vital information to the fire chief, which can then be used to guide firefighters away from potentially dangerous situations. The wireless sensors would form an ad-hoc network that can relay signals between nodes. A powerful transceiver would be placed in a favorable area, or carried by one of the firefighters in the team which would accumulate all the data coming in from all the sensors and send it for analysis to the fire chief. A heads-up display running on a laptop would provide updates from all the firefighters. An enhancement of our research would involve installing flow-meters in the fire hoses that would help the fire chief to monitor the water pressure in the hoses and can help to move firefighters out when the water is about to run low. A combination of these wireless sensors and the flow-meters would help the fire chief make decisions about marshalling the firefighters during an emergency and save lives.

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Prediction of Core Body Temperature for Firefighters

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Purpose: The proposed project will determine the safe duration of exposure and the cooling rate required for firefighters during firefighting activities. This will enable the core body temperature (T_c) to be regulated within its acceptable range. The hypothesis of this research is that by predicting the safe duration of exposure, the negative effects of heat-induced stress in firefighters can be avoided. Additionally, with the aid of external cooling, it will be possible to extend the safe working period for firefighters.

Design: The project will comprise of the following two specific aims:

1) Assess the safe duration of exposure in firefighters during firefighting activities without external

cooling. The working hypothesis is that in absence of external cooling, core body temperature (T_c) in the human body will rise during the firefighting activities. There are increased chances of heat stroke and brain damage as well as impaired thermal regulation that may lead to death as T_c increases beyond 40 ˚C. Prediction of the time taken to attain this critical T_c for individual firefighters will establish the safe duration of exposure.

2) Evaluate the external cooling rate required for firefighters to regulate T_c. The working hypothesis is that external cooling is required to remove heat from the human body and regulate T_c back to its acceptable range of 36.5 ˚C - 37.5 ˚C. Estimation of the required cooling rate will allow an extension of the safe working period and permit successful mitigation of heat-induced stress in individual firefighters during firefighting activities.

Methods: The de-identified firefighting data made available as a part of the already approved NIOSH-Targeted Research Training Project (TRT) for individual firefighters is analyzed. The project is implemented using the whole body model, which comprises of two components: the Pennes bioheat equation to simulate the temperature distribution in the body, and an energy balance equation to determine the change in blood temperature during a process. There are two major inputs to the computational whole body model. One is the heart rate time series and the other is the geometry and physiological details of the individual firefighters. For specific aim 1, the critical value of T_c is defined as 40 ˚C and the time taken to attain this critical value is computed. For specific aim 2, external cooling is simulated in the model with the addition of a heat flux term on the torso of the human body.

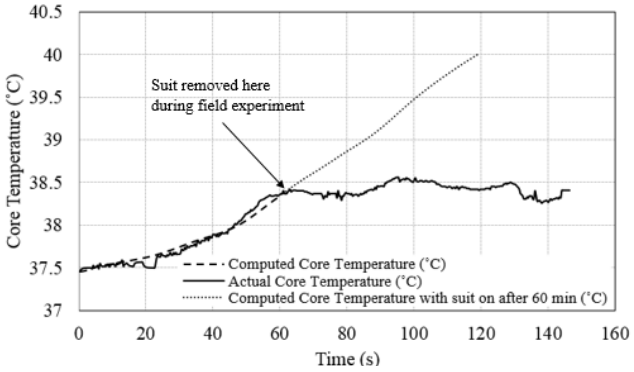

Figure 1: Computed and Actual T_c for firefighter

Expected Results: The expected results from this research are the assessment of safe duration of firefighting activity and the cooling rate to regulate T_c to its acceptable range. The firefighting data assessed includes periodic work and rest periods. Initial results of the whole body model with the firefighting suit on predicts that the critical value of T_c of 40 ˚C as per specific aim 1 will be reached in 2 hours.

Conclusion: The proposed project will predict the duration of exposure and cooling rate under transient body temperature conditions. The computed values will serve as a reference to verify the values from experiments/ trials in the future. The computational model can be an economically viable option to assess newer technologies for cooling over extensive and expensive field experiments.

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INVITED NON-PRP POSTER PRESENTATION ABSTRACTS

Prediction of Core Body Temperature, Sweat Rate, Cardiac Output and Stroke Volume for Firefighters using a 3D Whole Body Model

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Purpose: The proposed project will determine the core body temperature (T_c), sweat rate, cardiac output and stroke volume for individual firefighters using a whole body computational model. The hypothesis of this research is that the harmful effects of heat-induced stress in firefighters can be negated by responding to the predicted values of T_c, sweat rate, cardiac output and stroke volume.

Design: The objectives for the project are defined by the following four aims: 1) Revise the existing human body model to incorporate the firefighting suit. 2) Adapt the existing model to recreate the results of the collected data during live burn studies. 3) Determine the variations in core body temperature (T_c), sweating rate, cardiac output, stroke volume and heart rate during live burn activities in real time. 4) Inform fire departments of the warning signs that may lead to adverse events when exposed to working in hot environment.

Methods: The firefighting data, comprising of the heart rate time series and variation of T_c with time for individual firefighters is initially analyzed. The project is then implemented using the whole body model, which comprises of two components: the Pennes bioheat equation to simulate the temperature distribution in the body, and an energy balance equation to determine the change in blood temperature during a process. There are two major inputs to the computational whole body model. One is the heart rate time series and the other is the geometry and physiological details of the individual firefighters. The model is updated with the firefighter's geometry, which includes the firefighting suit. The heart rate time series is used as an input to obtain the result parameters. T_c obtained from the model is verified with the actual variation of T_c over time.

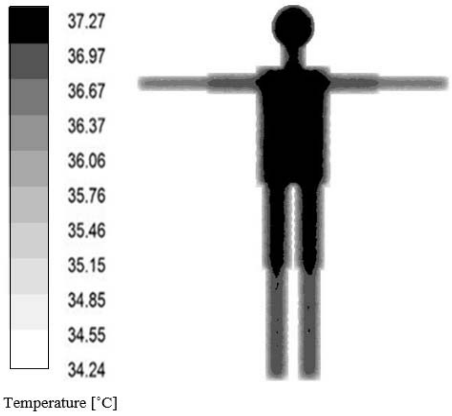

Figure 1: Steady state solution of human body model without firefighting suit at 25 ˚C

Results: The results obtained from this research are T_c, sweat rate, cardiac output and stroke volume for individual firefighters. The baseline case for the computational whole body model, without the firefighting suit, has been completed and verified. The baseline model is now updated with new geometry, which includes the firefighting suit. The model has been further adapted to incorporate the initial and boundary conditions for the available live-burn data.

Conclusion: The results obtained from this project would enable us to quantify the heat stress and physical exertion levels. With the aid of the predictive model, an accurate assessment of the physiological effects of heat strain on firefighters can be estimated, while also accounting for the age, sex and differences in physical parameters. It can also be used to notify management officials of the hazards of exposure to heat strain on firefighters identifying potential adverse events before they occur. Using these results, use of existing physiological monitoring devices can be limited or be modified to analyze health hazards and safety risks.

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Effects of Heat Stress on Firefighters' Postural Balance During Live Fire Fighting

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Objective: Measure the effect of physically demanding tasks performed under hot environment on postural balance characteristics.

Design: This balance study is a continuation of the study that has been performed in October 2011 where heart rate and core body temperature were recorded during a live burn. A second study was also performed in October 2012 to assess the development of postural balance recording of firefighters during live burn activities.

The design of the balance study is to evaluate the impact of heat stress on postural balance of firefighters during live burn (with and without live fire) training using wearable wireless/remote sensing multi-dimensional gyroscope and accelerometers. The heat stress and physical exertion levels will be quantified using a wearable sensors system "Bioharness" and an FDA approved ingestible radio pill (CoreHQ). These wearable sensors collectively will provide firefighters' heart rate, core body temperature and skin temperature during live burn training. Collectively, these outcomes will be used to determine an accurate assessment of the physiological effects of heat strain on firefighters. In the long term this data can be used to develop an algorithm that can notify others of the hazards and exposure to heat strain for firefighters identifying potential adverse events before they occur. Using these results, more accurate physiological monitoring devices may be developed to inform users more rapidly of hazards and safety risks. These results can also lead to the advancement of heat stress knowledge in multiple occupational disciplines and identify potential adverse events before they occur.

Method: Eighteen firefighters participated in live firefighting training (mean age 38.1 years ± 5.7, body weight 214 lbs ± 37, BMI 29 ± 4) while performing following tasks: search and rescue, hose advancement and backup, each performed for three different scenarios. Prior to heat exposure (PRE) and following each scenario (POST), firefighters' postural balance was assessed with a lightweight (weight 16 grams) wearable inertial sensor system quantifying time dependent changes in acceleration and angular velocity (AV) about three orthogonal axes [Anterior-Posterior (AP), Medial-Lateral (ML), and vertical (V)] during one foot balance test for 30 seconds. The data obtained were processed by creating phase plane plots between AV and angular displacement (AD) about three axes. The postural balance characteristics were quantified by the size (max excursions about three axes) of the phase plane plots, and set of stability metrics based on the root mean square (RMS) and variance of AD and AV about three axes.

Results: The stability parameter about the ML axis significantly increased from PRE to POST ($p < 0.10$). The max excursions, for the AV about ML axis also increased significantly from PRE to POST ($p < 0.10$). The RMS AV response from PRE to POST also increased significantly ($p < 0.10$) about the ML axis.

Conclusion: Significant increases in stability parameter, excursion, and RMS response about the ML axis, associated with tasks performed in hot environments, suggest an increase in postural instability, larger postural sway and increased efforts to maintain balance, respectively. These increased postural instability outcomes, around ML axis, in the front-back direction, may increase their risk of falling.

Acknowledgement: *This research study was supported by the National Institute for Occupational Safety and Health Targeted Research Training Program of the University of Cincinnati Education and Research Center Grant #T42-OH008432*

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Assessing the Protection Factor of Firefighters' Respirators against Combustion Ultrafine Particles

James Dietrich (PI), Sergey Grinsphun

Department of Environmental Health, University of Cincinnati

First responders and first receivers are routinely exposed to ultrafine particles during emergency response activities. Firefighters are often exposed to high concentrations of toxic, primarily ultrafine particles aerosolized by combustion. Coronary heart disease is the main cause of death among US firefighters during fire suppression. Chronic inhalation of ultrafine particles has been associated with the onset of debilitating cardiovascular health effects (Baxter et al., 2010). Personal protection devices such as respirators are widely used to decrease the inhalation exposure. However, there is insufficient information pertaining to the protection level provided by these respirators against combustion aerosols during various activities, e.g., overhaul operations.

The present study aims at investigating the penetration of ultrafine particles originated by combustion of different materials into elastomeric half-mask respirators worn by firefighters in the field. The protection factor of firefighters' respirators against these particles will be assessed. The field data will be compared to the findings of a recently published laboratory investigation of a half-mask performance.

The present study deploys a novel aerosol measurement device, developed and made available to the project by NIOSH. This particle size selective instrument (expected to be commercially available from Kanomax, Inc., Japan) utilizes the condensation nuclei counter principle and is capable of real-time measuring of aerosol particles starting at or below 10 nm. The device is used to measure the particle concentration outside and inside the respirator. A total 12 to 25 firefighters in training are being currently recruited. During each exercise, participants are asked to perform activities relevant to emergency response situations. In addition, the workplace aerosol will be characterized as to its concentration and particle size distribution through real-time measurements conducted by Nano-ID (Particle Measuring Systems, Inc., USA)

The study design was completed in Spring 2013. Contact has been established with Chiefs Thomas Lakamp and Russ Kammer. Both fire departments have approved their participation in the field study. The data collection phase was scheduled to begin in July 2013. Several sessions were initiated at NIOSH at UC labs to familiarize the project team with the new instrument and ensure that the field study design and protocols are adequate. However, due to unforeseen circumstances (multiple problems with the Kanomax aerosol instrument prototype), the data collection phase has not been started yet. The prototype has been modified three times by NIOSH and Kanomax during the period of May through August 2013. According to the modified plan, the laboratory tests will begin this October (control burns have been scheduled).

Acknowledgement: *This research study was supported by the National Institute for Occupational Safety and Health Targeted Research Training Program of the University of Cincinnati Education and Research Center Grant #T42-OH008432-07.*

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Evaluating the Effect of Heat Stress on Firefighters

Georganne Kincer (PI)[1], Kelley James[2], Ashu Mani[2], Jane Christianson[1], L. Sue Davis[1]

[1]College of Nursing, [2]Department of Environmental Health, University of Cincinnati

Purpose: This interdisciplinary study was designed to test emerging monitoring technology to detect adverse effects of heat stress on firefighters cardiovascular, neuromuscular, and cognitive systems during live burn events. Background: Sudden cardiac death is a primary cause of on-duty firefighter deaths. Heat stress and over exertion impact cardiovascular, neuromuscular, and cognitive systems. Real-time feedback of physiologi-

cal responses has the potential to allow incident commanders to remove firefighters from heat exposure and over exertion situations as they approach physiological limits, thus preventing on-duty injuries or fatalities.

Design: All subjects signed informed consents as per the approved IRB protocol. Data collection process was designed around the firefighters' Live Burn firefighting trainings. The trainings included 3 scenarios lasting approximately 10 to 20 minutes each followed by a rest period. Objective and subjective measures were gathered prior to the trainings (baseline) and at pre-scenario and post-scenario events throughout the trainings**.** CBT and Polar HR data were gathered continuously throughout the trainings.

Methods: Core body temperature (CBT) and heart rate (HR) were monitored continuously during three training scenarios using an FDA approved ingestible radio pill, Polar HR chest strap, and a CBT data recorder. The three scenarios included search and rescue, hose advancement, and backup. Rest measurements of blood pressure (BP), pulse, SpO2, tympanic temperature, height and weight were obtained. Pre- and post-scenario measurements of BP, pulse, SpO2, tympanic temperature, reaction times (RT), perceived exertion (RPE), perceived respiratory distress (RD), perceived thermal comfort (TC), postural sway, and height and weight were obtained.

Results: Real-time continuous CBT and Polar HR data increased as the firefighters progressed through each scenario. Correlation coefficients were between 0.95 and 0.98 for RPE, RD, and TC scales, and HR and tympanic temperatures. The remaining associations were weak. The results support the validity of using real-time monitoring of firefighters physiological responses during live burn events and the potential for systems to identify and remove firefighters from harmful situations.

Conclusion: We have examined the objectives of quantifying objective and subjective measures and of determining the association between these measures of heat stress and overexertion associated with Live Burn activities carried out by firefighters. Further data collection will be performed to determine if the results obtained so far will be sustained.

Acknowledgement:
This research study was supported by the National Institute for Occupational Safety and Health Targeted Research Training Program of the University of Cincinnati Education and Research Center Grant #T42-OH008432.
All of the co-investigators who have helped collect the data and have worked on this study.

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A Review of Occupational Health and Safety Implications of Exposure and Risk Management of Carbon Nanotubes and Carbon Nanofibers

Usonwanne Nwosu (PI), Emmanuel A. Iyiegbuniwe
Department of Public Health
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In the last decade, there has been rapid production and distribution of carbon nanotubes (CNTs) and carbon nanofibers (CNFs) in many industrial and biomedical applications. Although several research studies have documented various health effects, however, these studies are at their infancy in defining inhalation toxicity or explaining the physical-chemical properties of these nanomaterials. The paper discusses occupational exposure, toxicity, potential health risks and the precautionary principle as basis for recommended risk management practices for controlling exposure to CNTs and CNFs. Additionally, due to their respiratory hazards, exposures to CNTs and CNFs should be controlled below recommended exposure limit (1 μg/m3, 8-hr TWA, working lifetime of 45 years) or as low as possible through well-understood, cost-effective, and feasible interventions including exposure assessment, medical surveillance and screening programs. It is recommended that a multi-tiered exposure measurement strategy be developed to effectively determine exposure and limit work-

ers' risks to CNT and CNF. A number of other measures are also recommended based on the application of sound industrial hygiene control techniques (engineering control, administrative control or work practices, and the use of personal protective equipment) which are essential in designing effective local exhaust ventilation systems or in choosing appropriate respiratory protection.

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A Review of Current Regulatory Framework for Nanoparticles

Sireesha Kodali (PI), Emmanuel A. Iyiegbuniwe

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In recent years, nanoparticles have been employed in several industries to produce superior quality products and earn huge profits. Despite their wide-range of applications in many industries, including medicine, food and drugs, automotive, and cosmetics, nanoparticles do present various toxic effects to public and environmental health. Additionally, potential inhalation hazards from nanoparticles poses serious threat to workers in a variety of industries. Notable toxic effects include cell membrane penetration, cell integrity disruption, DNA damage, and cell-death. In consideration of nanomaterial toxicity, there is urgent need to develop regulatory schemas in the United States, and other developed countries. However, the proposed regulatory measures are still in the design or infancy phase due to ongoing research and the need for supporting evidence. This poster will review the history, context, and currently regulatory approaches for developing occupational exposure limits for nanoparticle hazards. In addition, the poster will provide an overview of current regulatory measures for nanoparticle exposure controls that have been proposed or undertaken in a number of developed countries in North America, European Union, and Australia. A comparison of current regulatory measures in four countries would be discussed. Based on this review, future research studies are recommended to effectively develop adequate standards to regulate nanoparticles in various occupational settings.

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Selected PRP Awardee Publications, Conference Presentations, and New Grants Based on PRP Results for 2013

Peer-Reviewed Publications:

Gillespie, GL, Bresler, S, Gates, DM, Succop, P: Posttraumatic Stress Symptomatology in Emergency Department Workers Following Workplace Aggression. Workplace Health & Safety, 2013; 61(6): 247-254. doi:10.3928/21650799-20130516-07

Gillespie, GL, Farra, SL, Gates, DM, Howard, PK, Atkinson, KL: The Qualitative Learning Experience of Healthcare Workers Completing a Hybrid Workplace Violence Educational Program. Journal of Nursing Education and Practice, 2013; 3(11): 54-64. doi:10.5430/jnep.v3n11p54

Gillespie, GL, Gates, DM, Berry, P: Stressful Incidents of Physical Violence against Emergency Nurses. OJIN: The Online Journal of Issues in Nursing, 2013; 18(1): manuscript 2. doi:10.3912/OJIN.Vol18No01Man02

Gillespie, GL, Gates, DM, Mentzel, T, Al-Natour, A, Kowalenko, T: Evaluation of a Comprehensive ED Violence Prevention Program. Journal of Emergency Nursing, 2013; 39(4): 376-383. doi:10.1016/j.jen.2012.12.010

He, X, Grinshpun, SA, Reponen, T, McKay, RT, Bergman, MS, Zhuang, Z: Effect of Breathing Frequency and Flow Rate on the Total Inward Leakage of an Elastomeric Half-Mask Donned on an Advanced Manikin Headform. Annals of Occupational Hygiene, 2013 (Accepted).

He, X, Reponen, T, McKay, RT, Grinshpun, SA: Effect of Particle Size on the Performance of an N95 Filtering Facepiece Respirator and a Surgical Mask at Various Breathing Conditions. Aerosol Science & Technology, 2013 (Accepted).

Heckel PF, Keener TC, and LeMasters GK: Background Soil Mercury: An Unrecognized Source of Blood Mercury in Infants? Online Journal of Soil Science, 2013; 3:23-29. doi:10.4236/ojss.2013.31004.

Jothimuthu, P, Wilson, RA, Herren, J, Pei, X, Kang, W, Daniels, R, Wong, H, Beyette, F, Heineman, WR, Papautsky, I: Zinc Detection in Serum by Anodic Stripping Voltametry on Microfabricated Bismuth Electrodes. Electroanalysis, 2013; 25:401-407.

Kang, W, Pei, X, Bange, A, Heineman, WR, Papautsky, I: Lab-on-a-chip Sensor with Evaporated Bismuth Film Electrode for Anodic Stripping Voltammetry of Zn. Electroanalysis, 2013; accepted.

Klabunde, RE, LePorte, AD, Wilson, T E: Effect of Temperature on Isoproterenol-induced Increases in Left Ventricular Developed Pressure. Journal of Thermal Biology, 38: 369-373, 2013.

Kowalenko, T, Gates, D, Gillespie, GL, Succop, P, Mentzel, TK: Prospective Study of Violence against ED Workers. American Journal of Emergency Medicine, 2013; 31(1): 197-205. doi:10.1016/j.ajem.2012.07.010

Nivedita, N, Papautsky, I: Continuous Separation of Blood Cells in Spiral Microfluidic Devices. Biomicrofluidics, 2013; 7: 054101.

Sergeev, AV Stroke Mortality Disparities in the Population of the Appalachian Mountain Region. Ethnicity & Disease, 2013; 23: 286-291.

Sliter, KA: Development and Validation of a Measure of Organizational Climate for Healthy Weight Maintenance. Journal of Occupational Health Psychology, 2013; 18: 350-362.

Smith, CR, Fisher, BS, Gillespie, GL, Beery, TA., Gates, DM: Adolescents' Experience with Workplace Aggression: School Health Implications. Journal of School Nursing, pre-publication February 20, 2013, DOI: 10.1177/1059840513479036

Zhou, J, Papautsky, I: Fundamentals of Inertial Focusing in Microchannels. Lab Chip, 2013; 13: 1121 - 1132.

Zhou, J, Papautsky I: Fundamentals of Intertial Focusing of Microparticles in a Rectangular Microchannel. Lab Chip, 2013; DOI:10.1039/C2LC41248A

Conference/Poster Presentations:

Arment, AR: Identification of Organophosphate-degrading Bacteria in Soil and Wastewater Through Phosphorus and Sulfur Starvation Moving towards the Bioremediation of VX. Oral presentation at Chemical, Biological, Radiological and Nuclear (CBRN) conference at AFIT-WPAFB, April 2-4, 2013.

Berry, PA, Gillespie, GL, Fisher, BS, Gates, DM, & Schafer, JC: Novice Nurse Coping after Workplace Bullying. Poster presented at the 37th Annual Research Conference, Midwest Research Nursing Society, Chicago, IL, March 2013

Britton, AR, Jex, SM: Differential effects of regulatory focus on safety compliance and safety participation. Poster presented at the 10th annual Work, Stress, and Health Conference, Los Angeles, CA, May, 2013

Chakravarthy, K (Arment, AR, Mentor): Malathion as a Model Compound for the Degradation of the Nerve Agent VX. Poster presentation at Beavercreek High School, International Science & Engineering Fair (ISEF), Phoenix, AZ, May 12-15, 2013. (Took 4th place internationally in competition in the area of microbiology)

Duckworth, K, Tran, T, Spencer, M, Miller, M, Grimaila, M, Racz, L: UV LED Disinfection of Water. 2013 CBRN Symposium, Air Force Institute of Technology, Wright-Patterson AFB, OH, April 2-4, 2013.

Gillespie, GL: Workplace Violence by Patients and Visitors against Nurses. [Invited Presentation] Paper presented at Mercy Hospital Fairfield, in Fairfield, OH, August, 2013.

Gillespie, GL: Workplace Violence in the Emergency Department. [Invited Presentation] Paper presented at the Innovative Approaches to the Management of Aggressive Behaviors in Health Care, CentraCare Health System: St. Cloud, MN, May 2013

Gillespie, GL, Gates, D, Berry, P: Consequences of Physical Aggression Experienced by Emergency Nurses. Paper presented at the 37th Annual Research Conference, Midwest Research Nursing Society in Chicago, IL, March 2013

Gillespie, GL, Gates, D, Berry, P: The Effects of Workplace Violence and Implications for Nursing Practice. [Invited Presentation] Paper presented at the 2013 Nursing Research Day, OhioHealth in Columbus, OH, March 2013

Gillespie, GL, Martsolf, D, Fisher, B, Peek-Asa, C Bresler, S, & Byczkowski, T: The Emotional Impact & Support Mechanisms for Workplace Violence. [Invited Presentation] Paper presented at the Greater Cincinnati Chapter American Assembly for Men in Nursing in Cincinnati, OH, April 2013

Gillespie, GL, Martsolf, D, Fisher, B, Peek-Asa, C, Bresler, S, Byczkowski, T: The Emotional Impact & Support Mechanisms for Workplace Violence. [Invited Presentation] Paper presented at the Nurses Week Celebration, University of Cincinnati Medical Center in Cincinnati, OH, May 2013.

He, X, Grinshpun, SA, Reponen, T: Effects of Breathing Frequency on the Performance of an Elastomeric Half-mask Against Combustion Aerosols Using an Advanced Manikin Headform. Student Poster presented at the American Industrial Hygiene Conference & Exposition (AIHce) 2013, Montréal, Canada, May 18-23, 2013. (awarded "Best Student Poster")

He, X, Grinshpun, SA, Reponen, T: How Does Breathing Frequency Affect the Filter Efficiency of an N95 Filtering Facepiece Respirator? Podium presentation at the American Industrial Hygiene Conference & Exposition (AIHce) 2013, Montréal, Canada, May 18-23, 2013.

Lovejoy, S, Gillespie, GL, Christianson, J: Physical Inactivity, Stress, and Injury among Emergency Responders. Poster presented at the 2013 Annual Conference, American Association of Occupational Health Nurses in Las Vegas, NV, April 2013

Liu, Y, Koltick, DS, Byrne, P, Zheng, W, Nie, LH: Development of a Transportable Neutron Activation Analysis System to Quantify Manganese in Bone In Vivo – Feasibility and Methodology. Abstract accepted for the 2013 annual SOT meeting, San Antonio, TX, Mar.10-14, 2013

Kadambi, P, Lovelace, JA, Beyette Jr., FR: Changes in Behavior of Evoked Potentials in the Brain as a Possible Indicator of Fatigue in People. Poster presentation at the 35th Annual International Conference of the IEEE Engineering in Medicine, July 2013.

Lovelace, JA, Witt, TS, Beyette Jr., FR: Modular Bluetooth Enabled Wireless Electroencephalograph (EEG) Platform. Poster presentation at the 35th Annual International Conference of the IEEE Engineering in Medicine, July 2013.

Lovelace, JA, Witt, TS, Beyette Jr., FR: Bluetooth Enabled Electroencephalograph (EEG) Platform. Oral presentation at the 56th International Midwest Symposium on Circuits and Systems, August 2013.

Kadambi, P, Lovelace, JA, Beyette Jr., FR: Audio Based Brain Computer Interfacing for Neurological Assessment of Fatigue. Poster presentation at the 6th International Conference IEEE EMBS Conference on Neural Engineering, November 2013.

Racz, L, Harper, WF, Miller, M, Grimaila, M, Magnuson, M, Willison, S, Tran, T, Duckworth, K, Spencer, M, Richwine, J: Ultraviolet Light Emiting Diode Use in Water Disinfection. Military Health Systems Research Symposium, Fort Lauderdale, FL, Aug 12-15, 2013.

Saxon, R, Gillespie, GL, Christianson, J: Emotional Impact & Support for Victimized Emergency Department Workers. Poster presented at the 2013 Annual Conference, American Association of Occupational Health Nurses in Las Vegas, NV, April 2013.

Sergeev, AV: Coronary Revascularization Procedure Mortality in Patients with Coexisting Pneumoconiosis: Outcomes after Coronary Artery Bypass Grafting and Angioplasty Are Similar. Presented at the American Heart Association (AHA) Cardiovascular Epidemiology and Prevention Scientific Sessions, New Orleans, LA, March 19-22, 2013.

Sergeev, AV: Mortality After Cardiovascular Procedures in Patients with Coexisitng Pneumoconiosis. Presented at the Ohio Public Health Combined Conference, Columbus, OH, May 20-22, 2013.

Sergeev, AV: Racial Disparities in Coronary Revascularization Procedure Mortality: Does the Type of Procedure Matter? Presented at the American Heart Association (AHA) Cardiovascular Epidemiology and Prevention Scientific Sessions, New Orleans, LA, March 19-22, 2013

Shukla, A, Revilla, F, Bhattacharya, A: Classification Of Postural Balance in Parkinson's Patients Using Support Vector Machines. (Invited paper), (Accepted) IEEE/ASME Dynamics Systems and Control Conference, Stanford, CA, Oct 2013.

Sliter, KA: The Concise Physical Activity Inventory: Developing and Validating a Brief Physical Activity Measure. Paper presented at the 10th annual Work, Stress, and Health conference, Los Angeles, CA, May, 2013.

Sliter, KA, Jex, S, Zickar, MJ: The Development and Validation of the Workplace Climate for Healthy Weight Maintenance Scale. Paper presented at the 28th annual conference of the Sociey for Industrial-Organizational Psychology, Houston, TX, April, 2013.

Sliter, MT, Ahonen, E: Coping with trauma: Efficacy of Coping Mechanisms for Dealing with Traumatic Work Events. Poster presented at the 10th annual Work, Stress, and Health Conference, Los Angelos, CA, May, 2013.

New Grants Funded in 2013 Based on PRP Results:

Gillespie, GL(PI), Brown, K, Ulrich, D, Worcester, P, Shay, A, Beckstedt, K, Boesch, M, Beyer, D, Tibbs, D, Anderson, M, Hieber, K, *Workplace Violence and Bullying Training for Nursing Students,* CDC/National Institute for Occupational Safety and Health # 200-2013-M-57090, 2013 – 2014, $67,542

Grinshpun, SA (PI)(mentor to He, X), *Applicability of NaCl Challenge Aerosol for Assessing the Filter Performance of N95 Filtering Facepiece Respirators (FFRs) against Combustion Aerosol Hazards*, National Personal Protective Technology Laboratory (NPPTL), NIOSH in Pittsburgh, 09/01/2013 – 08/30/2014, $24,950.

Nie, LH (PI): *Development and Validation of a Neutron Activation Analysis (NAA) System to Quantify Metals in Bone in Vivo*, Purdue Research Foundation Fellowship, 07/01/2013-06/30/2014, $18,000

Papautsky, I (PI), *Development of a Lab-on-a-Chip for Point-of-Care Biomonitoring of Blood Metals*, NIEHS, 09/01/13 - 05/31/17, $1,550,000

Smith, CR (PI), Succop, P, *Validation of Workplace Violence Instruments Among Adolescent Employees*, Dean's New Investigator Award, University of Cincinnati College of Nursing, 6/1/2013 – 5/31/2014, $7,960

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We are especially grateful to the Academy of Kettering Fellows for their continued support of the Annual PRP Symposium.

Additional financial support from an anonymous faculty donor for the PRP Networking Picnic is gratefully acknowledged.

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