NIOSH-Supported
Education and Research Center

11th Annual

2010 Pilot Research Project (PRP) Symposium

October 14—15, 2010

Kehoe Auditorium, Kettering Laboratory

Department of Environmental Health
University of Cincinnati College of Medicine

Thursday, October 14th 1:00 pm—5:15 pm

Friday, October 15th 8:00 am—12:15 pm

Keynote Speakers

Linda Forst, MD, MS, MPH

University of Illinois at Chicago

and

Ren G. Dong, PhD

Health Effects Laboratory Division
NIOSH, Morgantown, WV

Podium and Poster Presentations by PRP Awardees

Supported by NIOSH grant #T42-OH008432

UNIVERSITY OF Cincinnati

Pilot Research Training Program & Symposium

Welcome to the University of Cincinnati Education and Research Center's (ERC) **11th Annual Pilot Research Project (PRP) Symposium** on October 14-15, 2010, at the Kettering Lab Complex's Kehoe Auditorium. The purpose of the PRP is to increase the research capacity of research trainees and young investigators in occupational health and safety and to encourage those in related disciplines to pursue occupational health and safety research.

Under the administrative direction of Dr. Amit Bhattacharya, research proposals are solicited and peer-reviewed annually 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 2009-10 awardees will be presenting the results of their research and the 2010-11 awardees will make poster presentations of their proposed work. The keynote speaker on **Thursday, October 14, 2010 at 1:00 pm** will be **Dr. Linda Forst,** Professor at the University of Illinois at Chicago**,** who will deliver her keynote address on ***"Hispanic Day Laborers in Construction."*** **Dr. Ren G. Dong,** Leader of the Physical Effects Research Team in Engineering and Control Technology Branch at the National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV, will deliver his keynote address on ***"Future Research in Hand-Transmitted Vibration Exposure"*** on **Friday, October 15, 2010 at 8:00 am.** Both presentations will be given in the Kehoe Auditorium in the Department of Environmental Health's Kettering Lab Complex at the University of Cincinnati's College of Medicine campus. 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 17 such centers funded by the National Institute for Occupational Safety and Health (NIOSH) nationally. Dr. Carol Rice 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 $850 thousand dollars to support pilot research projects. These projects have served as a catalyst in bringing over $26.2 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), 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 24 new investigators from other fields of expertise to the area of occupational safety and health research.

TABLE OF CONTENTS

Pilot Research Project Training Program & Symposium Overview..... 2

Keynote Speaker Biography: Linda Forst, MD, MS, MPH..... 4

Keynote Speaker Biography: Ren G. Dong, PhD..... 5

Thursday Symposium Schedule..... 6

Friday Symposium Schedule..... 7

Poster Presentation List..... 8

2009-10 Awardees Podium Presentation Abstracts..... 9 — 16

2010-11 Awardees Poster Presentation Abstracts..... 17— 23

Notes..... 24, 26

2009-10 Pilot Research Program Steering Committee Members 25

Special Acknowledgements..... 27

Symposium attendees are eligible for:

- ◊ **1.0 ABIH (IH) CM Point Approval #09-3729**
- ◊ **Meets BCSP criteria for continuation of certification credit**
- ◊ **8.2 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 #100515-1**

The 11th 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

Keynote Speaker, Thursday, October 14, 2010

Linda Forst, MD, MS, MPH

Professor and Director,
Environmental and Occupational Health Sciences,
School of Public Health,
University of Illinois at Chicago

Linda Forst is the Director and Professor of Environmental and Occupational Health Sciences at the University of Illinois at Chicago School of Public Health and Associate Professor of Emergency Medicine at University of Illinois at Chicago College of Medicine. Dr. Forst received her MD from Michigan State University, her MPH from UIC, and completed residency training in Occupational Medicine and Internal Medicine at Cook County Hospital in Chicago. From 1988 to 1991, Dr. Forst was Chief Physician at the Greater Cincinnati Occupational Health Center.

Board certified in Internal and Preventive Medicine, Dr. Forst has received numerous honors including the Stetler Fellow for women in science and the Agency for Toxic Substances and Disease Registry Fellow. Her current research is in the area of Occupational Health Disparities and Injury Surveillance. She has worked with Hispanic and foreign-born workers, food service workers, and construction workers. Dr. Forst was one of the invited speakers at the 2010 OSHA Summit on Hispanic Workers in Houston, Texas. She is also the past Executive Editor of the Archives of Environmental and Occupational Health and consulting editor for numerous scientific journals.

Keynote Speaker, Friday, October 15, 2010

Ren G. Dong, PhD

Leader, Physical Effects Research Team in Engineering and Control Technology Branch, National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV

Ren G. Dong serves as Leader of the Physical Effects Research Team in Engineering and Control Technology Branch in the Health Effects Laboratory Division at the National Institute for Occupational Safety and Health (NIOSH). He is also Adjunct Professor at West Virginia University. Dr. Dong received his BSc in 1982, his MEng in 1984, and his PhD in Mechanical Engineering in 1994. He worked as a lecturer in Southwest Jiaotong University from 1985 to 1988. and has completed more than 20 research and/or engineering projects primarily related to machine tribology, railway wheel/rail interaction, and vehicle dynamics in three institutes: Southwest Jiaotong University, Cocordia University, and National Research Council Canada. Since joining NIOSH in 1999, Dr. Dong has led the research in human vibration exposure, especially hand-transmitted vibration exposure and has published more than 70 peer-reviewed journal articles in the last 10 years. Dr. Dong has received numerous honors including the Liberty Mutual Award and several NIOSH's Alice Hamilton Awards in the last five years.

PODIUM PRESENTATION SCHEDULE

	Thursday, October 14, 2010		
	Moderator: Kermit Davis, PhD, University of Cincinnati		
Time	**Title**	**Speaker**	**Affiliation**
1—1:30 pm	Welcome and Opening Remarks	Carol Rice, PhD, CIH ERC Director Amit Bhattacharya, PhD, CPE, PRP Program Director	Environmental Health University of Cincinnati Environmental Health University of Cincinnati
1:30—1:35 pm	Introduction of Keynote Lecturer: Linda Forst, MD, MS, MPH, Professor, School of Public Health, University of Illinois at Chicago	Amit Bhattacharya, PhD, CPE PRP Program Director	Environmental Health University of Cincinnati
1:35—2:20 pm	Keynote Address: "Hispanic Day Laborers in Construction"	Linda Forst, MD, MS, MPH, Professor	School of Public Health University of Illinois at Chicago
2:20—2:30 pm	Keynote Q & A		
2:30—2:50 pm	Firefighters' Exposure to Fine Particles and Polycyclic Aromatic Hydrocarbons	Erin Haynes, DrPH	Environmental Health University of Cincinnati
2:50—3:10 pm	Modeling Teacher Exposure to Mercury at Schools	Pamela Funderburg Heckel, PhD	Environmental Health University of Cincinnati
3:10—3:30 pm	The Role of Workplace Hostility in Employee Well-being and Performance	Shuang Yueh Pui, PhD	Psychology Bowling Green State University
3:30—4:10 pm	Poster Session I and Break		
4:10—4:30 pm	PAH Exposure in Municipal Firefighters	Erin Haynes, DrPH, for Michael Knipp, MD	Environmental Health University of Cincinnati
4:30—4:50 pm	Exposure Assessment and Real-time Evaluation of Road Surface Planer Dust Control Technology for Highway Construction Applications	Bryan Hubbard, PhD, PE and Beauregard Middaugh	Building Construction and Management Purdue University
4:50—5:10 pm	Daily Workplace Barriers and Facilitators to Proper Nutrition and Exercise	Katherine Alexander	Psychology Bowling Green State University
5:15—7:00 pm	PRP Networking Picnic Sponsored by the Academy of Kettering Fellows		Kettering Laboratory Front Lawn & Atrium

PODIUM PRESENTATION SCHEDULE

	Friday, October 15, 2010		
	Moderator: Diana Schwerha, PhD, Ohio University		
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: Ren G. Dong, Ph.D, Leader of Physical Effects Research Team in Engineering and Control Technology Branch, National Institute for Occupational Safety and Health (NIOSH)**	**Amit Bhattacharya, PhD, CPE PRP Program Director**	**Environmental Health University of Cincinnati**
8:15—9:00 am	**Keynote Address: "Future Research in Hand-Transmitted Vibration Exposure"**	**Ren G. Dong, PhD, Leader of Physical Effects Research Team in Engineering and Control Technology Branch**	**National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV**
9:00—9:10 am	**Keynote Q & A**		
9:10—9:30 am	**Usability Study of Area Agency on Aging Websites in the State of Ohio**	**Kyle Lynch for Diana Schwerha, PhD**	**Industrial and Systems Engineering Ohio University**
9:30—9:50 am	**Profiling of the Actinobacteria Community in Moisture-damaged Buildings**	**Elisabet Johansson, PhD**	**Environmental Health University of Cincinnati**
9:50—10:10 am	**Improved Assessment of Frequency Dependence on Vibration-induced Vascular Damage**	**Rupak K. Banerjee, PhD, PE**	**Mechanical Engineering University of Cincinnati**
10:10—10:50 am	**Poster Session II and Break**		
10:50—11:10 am	**Vibration Analysis of Finger Using Non-linear FEM to Understand HAV Syndrome**	**Shrikant P. Pattnaik**	**Mechanical Engineering University of Cincinnati**
11:10—11:30 am	**Workplace Incivility as a Threat to Safety Behaviors among Nurses**	**YoungAh Park**	**Psychology Bowling Green State University**
11:30—11:50 am	**Exploring Adolescent Employees' Perceptions of Safety from Workplace Violence**	**Carolyn Ross Smith, RN, MSN**	**College of Nursing University of Cincinnati**
11:50—12:10 pm	**Blood DNA Markers for Breast Cancer Associated with Heavy Metal Exposure**	**Xiang Zhang, PhD**	**Environmental Health University of Cincinnati**
12:10—12:20 pm	**Closing Remarks and Program Evaluation**		

POSTER PRESENTATION LIST

No.	Title	Author	University
1	The Effects of Bullying on Productivity and the Novice Nurse	Peggy Ann Berry, MSN, COHN-S, SPHR	College of Nursing University of Cincinnati
2	Firefighter Garment Based Carbon Foam Fabric	Ahmed Elgafy, PhD	School of Dynamic Systems University of Cincinnati
3	A Novel Low-cost Microsensor for Point-of-care Multi-gas Monitoring	Ian Papautsky, PhD	Electrical and Computer Engineering University of Cincinnati
4	Workplace Culture: Psychometric Evaluation of the Nursing Culture Assessment Tool	Andrea Borchers, RN, MSN	College of Nursing University of Cincinnati
5	Tai Chi: A Possible Way to Reduce Cardiovascular Risk Factors in Firefighters	Jane Christianson, RN, MSN	College of Nursing University of Cincinnati
6	Cyber and Face-to-Face Incivility and Employee Well-being: A Daily Investigation	YoungAh Park	Psychology Bowling Green State University
7	Exposure Assessment and Real-time Evaluation of Roadway Surface Cleaner Particulate Suppression during Highway Construction	Beauregard Middaugh	School of Health Sciences Purdue University
8	Reduction of Health-Care Worker Exposure to Pandemic Flu Virus in Hospital Rooms	Aravind Kishore	School of Dynamic Systems University of Cincinnati
9	A Pilot Study: Body Damping and Bone Fracture	Ozan Akkus, PhD	Biomedical Engineering Purdue University
10	Effect of Aging on Human Postural Control: A Predictive Modeling Approach	Renu Sah, PhD	Psychiatry University of Cincinnati
11	Cardiac Contractility and Oxygen Consumption in Work-related Heat Syncope	Thad E. Wilson, PhD	College of Osteopathic Medicine Ohio University

Poster Sessions are held in the Atrium (down the hall from Kehoe Auditorium in Kettering Lab)

- **1.0 ABIH (IH) CM Point Approval #09-3729**
- **Meets BCSP criteria for continuation of certification credit**
- **8.2 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 #100515-1**

2009-10 PRP Awardees
PODIUM PRESENTATION ABSTRACTS

Firefighters' Exposure to Fine Particles and Polycyclic Aromatic Hydrocarbons

Erin Haynes[1], C. Stuart Baxter[1], Tiina Reponen[1], Joseph Hoffman[1], Ronald J. Texter, [2]
[1]Department of Environmental Health, University of Cincinnati.
[2] District Chief of Safety, Cincinnati Fire Department

Firefighters, one of the most hazardous and yet least studied occupations, are exposed to fine particles and diverse chemicals, including polycyclic aromatic hydrocarbons (PAHs). Epidemiological studies have revealed an increased incidence of several types of cancer. **Purpose**: This pilot study was carried out to characterize firefighter exposures in the firehouse and in the overhaul stage of fire suppression to fine particles, which have been associated with cardiovascular disease, and PAHs, many of which are carcinogenic. Exposures were compared to those of UC Radiation Safety Office (RSO) Staff. **Methods**: Fine particles were collected using PMI (Personal Modular Impactor)-samplers equipped with 37-mm diameter Teflon filters. Two P-Trak fine particle counters measured number concentrations of particles in the size range of 0.02 -1 um with 1-minute resolution and operated side-by-side with stationary samplers measuring PM 2.5. Air densities of 17 Polycyclic Aromatic Hydrocarbons (PAHs) were determined using a personal pump and 37-mm diameter Teflon filter, followed by an XAD-2 sorbent tube. **Results:** The highest mean particle number concentrations in the kitchens of two Cincinnati firehouses were over 7 -10 times those in the break room of the control RSO site. Compared to this site the highest particle mass concentrations in firehouse 19 (truck bay) and 14 (kitchen) were more than 10 and 30 times higher, respectively. During overhaul mean air number densities of fine particles ranged from 30,692 to 198,850 particles/cm^3 and mass concentrations varied from 253 to 17,530 $\mu g/m^3$. Naphthalene was detectable in two of the samples collected at firehouse 19 in the kitchen and truck bay at concentrations in the range 1 ppm. Naphthalene and acenaphthylene were detectable at concentrations of 1-5 ppm during overhaul events. **Conclusions:** Firefighters are exposed to high levels of fine particles and airborne PAHs in the firehouse and/or during overhaul. Further characterization of particles at the firehouse and fire scene, particularly during overhaul, is warranted. The results of this study are consistent with those recently reported elsewhere and will be critical in the preparation of a large-scale multidisciplinary epidemiologic investigation of cancer and cardiovascular disease in a cohort of firefighters occupationally exposed to fine particles.

Modeling Teacher Exposure to Mercury at Schools

Pamela Funderburg Heckel, Grace LeMasters
Department of Environmental Health
University of Cincinnati

The scarcity of reliable air monitoring data for elemental Hg and the inability of existing hand-held instruments to detect low levels of ambient Hg led the author to develop alternate methods to gauge ambient mercury exposures. The focus of research related to ambient air pollution is often children. Teachers, however, spend most of their careers at the same school or school district and work on average 29 years. This chronic exposure can result in high life-time cumulative exposures to air toxicants including elemental constituents of traffic exhaust such as mercury (Hg), the focus of this study. Neurological research has shown that Hg^{II} adsorbed onto particles can enter the brain through the nasal mucosal passages and can affect the cardio-vascular and central nervous systems resulting in permanent neurologic disabilities. Studies have shown a progressive increase in the number of sick days of teachers and findings from our lab indicate that teachers have a higher fall rate than jobs in manufacturing and retail. This study is the first to investigate ambient Hg exposures of teachers using an insect as a surrogate bioindicator.

Characterizing long-term cumulative exposure to Hg is challenging. The detection limit (0.5 micrograms/m^3) of commercially available hand-held mercury analyzers is too high to reliably measure ambient Hg. The most common biomarkers of exposure – urine, hair and blood – reflect a dose-response relationship between acute exposures to Hg but are less informative about a life-time cumulative exposure. Therefore, this study used the AERMOD air pollution dispersion model to estimate the ambient Hg^0 concentration and daily gaseous Hg deposition at each school. In the absence of long term accumulative biomarkers such as teeth and bones, a bioindicator such as periodical cicadas collected at the schools were used to provide an indication of chronic, low-level exposures which cannot be measured by existing hand-held instruments. The correlation between the average daily gaseous mercury deposition and the bioaccumulation of Hg in cicadas collected at schools provided an estimate of long-term exposure of teachers to industrial sources of pollution. The results of this study indicate a relationship ($p=0.20$) between total Hg in periodical cicadas and model-generated estimates of gaseous Hg deposition. For those sites located within 500m of a state highway, distance was a significant predictor of Hg exposure ($p=.006$; $R^2=0.20$). For sites beyond 500m, distance was not predictive. Thus this study provides a novel approach for estimating the chronic, low level Hg exposure of teachers.

The Role of Workplace Hostility in Employee Well-being and Performance

Shuang-Yueh Pui, Michael T. Sliter, Katherine A. Wolford, Steve Jex
Psychology Department
Bowling Green State University

The present study examined the role of customer and coworker hostility (i.e., incivility and aggression) on employee burnout, physical well-being, and job performance. Further, it investigated the moderating role of trait anger and social support in the above relationship. We collected data from 75 call center employees at a Midwestern bank at two time points, three months apart. Results showed that customer incivility and customer aggression had a significant positive relationship with burnout, and customer incivility had a significant negative relationship with performance. No significant results were found for physical well-being. Trait anger and social support were found to moder-

ate the above relationships, but in an unexpected direction. These findings contributed to the literature on workplace hostility and encourage more future research in this area.

PAH Exposure in Municipal Firefighters

Michael Knipp, C. Stuart Baxter, Erin Haynes, C. Sue Ross, Samarat Yeramaneni
Department of Environmental Health
University of Cincinnati

Municipal firefighters remain one of the least studied occupation populations, specifically regarding cancer risk. Recent epidemiological work has revealed an excess of multiple myeloma, non-Hodgkins lymphoma, prostate, and testicular cancer. As a consequence the WHO has classified firefighting as "possibly carcinogenic to humans." **Purpose**: Genotoxicity, deleterious alteration of genetic material, is a major proposed mechanism by which external agents may cause carcinogenesis, and PAH are a proposed major source in firefighters. The purpose of this study was to monitor PAH exposure through measurement of urinary 1-hydroxypyrene (1-HP) and PAH collected on skin wipes. 1-HP and PAH concentrations were measured in a cohort of newly recruited firefighters before and after a fire training event and in a cohort of experienced firefighters. **Methods:** Urine samples and skin wipes were analyzed according to established methodology. Each group of firefighters (recruits and experienced) completed a baseline questionnaire to assess their previous firefighting experience, medical history related to cancer, and recent consumption of food with known high PAH levels such as barbequed meat and olives, as well as an exposure Report Form prepared and distributed by the Cincinnati Fire Fighters Union Local 48. This form collects information on the fire event, their responsibility during the event, and length of the event. **Results:** in data analyzed to date no apparent increase in urinary 1-HP was found in new recruits before or after a single fire training event. A 3-4 fold increase in experienced firefighters was observed under the same conditions, however. Concentrations of measured PAH in skin wipes from new recruits after single training exercise were less than limits of quantitation, while in experienced firefighters concentrations of the benzo(b, k or l) fluoranthenes exceeded these limits by an order of magnitude in the majority of firefighters. There is sufficient evidence for animal carcinogenicity for all of these agents according to IARC. **Conclusions:** Successful partnerships with the Cincinnati Fire Department have led to an effective method for collecting skin PAHs. A majority of professional firefighters had dermal exposure to the PAH carcinogens *benzo{b,j,k] fluroanthane and benzo[a]pyrene* during fire events lasting less than 1 hour. The results of the urinary 1-HP for the firefighters and control group are currently being further analyzed.

Exposure Assessment and Real-time Evaluation of Roadway Surface Planer Dust Control Technology for Highway Construction Applications

Beauregard Middaugh[1], Bryan Hubbard[2], Neil Zimmerman[1], James McGlothlin[1];
[1]School of Health Sciences, [2]Department of Building Construction and Management
Purdue University

Roadway rehabilitation is a vital process used to maintain the pavement transportation system. Cold-planer equipment attachments are an integral piece of equipment used to grind away de-

teriorated pavement before resurfacing. During this removal process, the cold-planer produces airborne respirable (RSP) dust and quartz, which is associated with silicosis, a progressive lung fibrosis. For this study, the cold-planer attachment was used in conjunction with an open-cab skid steer loader. When the cold-planer was operated with no dust control, assuming typical 3-hour task duration, filter samples revealed that the operator's estimated 8-hour TWA exposure to RSP dust and quartz was below the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV). A dust control method consisting of an aftermarket water-supply system rated at 0.39 gallons per minute. (1.5 LPM) was also evaluated using filter samples and direct-reading measurements; however, dust reductions were not substantial for the system. The flow rate could be increased to 1.5 gallons per minute (5.7 LPM) by using a water pump and increasing the water tank volume to 50 gallons (189.6 L); however, future research is needed to evaluate the effectiveness of this system. The affect of wind conditions on worker exposure was also assessed during the study using direct-reading instruments and a real-time weather meter. The operator's downwind dust exposure was significantly higher than upwind dust exposure ($p<0.01$), with an average percent reduction of greater than 80.0 percent for upwind exposure compared to downwind exposure. These findings conclude that field studies of RSP dust can be significantly biased when wind conditions are not comparable between dust control methods.

Daily Workplace Barriers and Facilitators to Proper Nutrition and Exercise

Katherine Alexander[1], Joseph Mazzola[2], Jeffery Taylor Moore[3], Steve Jex[1]
Department of Psychology, [1]Bowling Green State University,
[2]University of South Florida, [3]Colorado State University

This study examined workplace barriers and facilitators to employee's healthy behaviors, including eating healthy and exercising. We collected qualitative and quantitative data from 86 participants on a daily basis for one week. Participants reported many factors they encounter in the workplace, as well as in other domains of their life, which either inhibit or facilitate their ability to eat well and exercise. Several other exploratory hypotheses with the quantitative data, however, were not supported. Findings from this study could help organizations create interventions and directives that can specifically target the barriers that employees most commonly report as preventing them from eating healthy and working out. Further analyses with this data will include looking at daily fluctuations in participant's healthy behaviors as well as a scale development based on the qualitative findings.

Usability Study of Area Agency on Aging Websites in the State of Ohio

Diana J. Schwerha, Kyle Lynch, Tripura Vadlamani
Industrial and Systems Engineering
Ohio University

Increasingly more health care, economic, and social information for older adults will be communicated and distributed through the web. One agency that provides much of this information free of charge to its constituents is the Area Agency on Aging (AAA). In the state of Ohio, eleven agencies provide information to Ohio residents. Although much of the information provided to residents is similar, the websites are very different in design with each having the potential for good or bad usability. The purpose of this study was to categorize the Ohio AAA websites by designing a heuristic specifically for older adults' web usability, validate the heuristic through performance metrics, and provide recommendations for better re-design. Thirty-one adults age 50+ participated in the study and the heuristic was validated. Of the four categories in the heuristic (navigation, readability, content/organization, and accessibility), results indicated that navigation parameters most strongly influenced performance. Results from the study will be given as recommendations for re-design of the AAA websites.

Profiling of the Actinobacteria Community in Moisture-damaged Buildings

Elisabet Johansson[1], Jagjit Yadav[1], Stephen Vesper[2], Tiina Reponen[1], Sergey Grinshpun[1]
[1]Department of Environmental Health, University of Cincinnati
[2]Environmental Protection Agency, Cincinnati, OH

Indoor air contains components of bacterial origin, some of which have implications for respiratory health. The diversity of airborne bacterial communities in indoor environments has not been well characterized. The purpose of this project was to characterize bacterial communities in indoor environments. The study focused on Actinobacteria, of which a number of species have been implicated in respiratory health in previous studies, and on *Streptomyces*, a large genus belonging to the Actinobacteria class.

Denaturing gradient gel electrophoresis (DGGE) was used to explore bacterial diversity in dust samples from moisture damaged buildings and reference buildings in the Cincinnati area. Hypervariable regions in the 16S gene were amplified using primers specific for Actinobacteria and streptomycetes, respectively, and the PCR products were resolved on DGGE gels. Cloning and DNA sequencing was used to achieve taxonomic identification of DGGE bands corresponding to *Streptomyces* species.

The cloning and sequencing experiments showed that the most prominent DGGE bands corresponded to clades containing several closely related species. Among the identified candidate species were *S. griseus* and *S. coelicolor*, *S. hygroscopicus*, and *S. samsonii,* all of which have been isolated using culture techniques from moisture damaged building materials in earlier studies.

The protocol developed in this study is expected to be broadly applicable for the assessment of Actinobacterial communities in a wide range of buildings occupied by humans, including non-industrial workplaces such as schools, office buildings, and health care environments. Further studies are necessary for detailed characterizations of the Actinobacteria communities to species level.

Improved Assessment of Frequency Dependence on Vibration-Induced Vascular Damage

Srikara V. Peelukhana[1], Shilpi Goenka[2], Jay Kim[1], Keith Stringer[3], Rupak K. Banerjee[1]
Department of Mechanical Engineering[1],
Department of Chemical and Materials Engineering[2],
University of Cincinnati.
Department of Pathology[3], Cincinnati Children's Hospital and Medical Center

Hand-Arm Vibration Syndrome (HAVS) is one of the major vibration disorders found in the workers using power tools. It results because of damage to the musculo-skeletal system, sensory-neural system, and the vascular system in the hands and arms. While extensive research has been done on the damage caused due to vibration, the exact mechanism and the effect of various dynamic factors of vibration, viz. frequency, acceleration, and amplitude, leading to damage need to be determined.

This study has been planned to assess the effect of vibration frequency on vibration-induced vascular damage in fingers. *In-vivo* experiments were done on 13 male Sprague-Dawley rats (250 ± 15 gm). Rats were restrained in standard acrylic restrainer and the tails were strapped to a plexiglass platform and vibrated at 0 Hz (control group, 3 rats), 125 Hz and 250 Hz for 1 day (1 rat each), 5 days (1 rat each) and 10 days (3 rats each), for 4 hours/day at a constant, instantaneous, unweighted acceleration of 49 m/s^2. Damage caused due to increasing vibration frequency in the rat-tail ventral artery was assessed using histological techniques. The number of vacuoles was compared for the control group and the one vibrated at 125 Hz for 10 days. Reaction to anti-Nitrotyrosine labeling, a marker for inflammation, was quantified with color densitometry using an image analysis software and compared for all the groups. Simultaneous *in-vitro* experiments (Specific aim #2) with flexible and rigid tubing under various vibration frequencies, applied on both a horizontal and vertical column of fluid subjected to longitudinal vibrations, were conducted to simulate the rat-tail model using a bench-top flow loop system.

In the rat tail experiments, damage to the rat-tail increased with higher vibration frequency. The number of vacuoles in the endothelial lining, surrounding the rat-tail ventral artery increased from 9 ± 1 to 27 ± 3, and in the smooth muscle cell, the number of vacuoles increased from 10 ± 2 to 36 ± 3 from the control group to 125 Hz group. The inflammatory response of the rat-tail ventral artery progressively increased from control group (77.35 ± 14.02) to 125 Hz (115.41 ± 20.13 for 1 day, 125.47 ± 16.50 for 5 day and 121.21 ± 11.78 for 10 day) and subsequently for the 250 Hz group (136.85 ± 10.79 for 1 day, 150.41 ± 10.92 for 5 day, 146.18 ± 12.55 for 10 day). There was a marked increase in the inflammatory response as the frequency increased but the duration of the timing within the each group had somewhat lesser influence on inflammation. The effect of duration needs to be further assessed.

In the *in-vitro* experiments, with increasing vibration frequency horizontal column subjected to longitudinal vibrations induced very little or no observable reduction in flow, while the vertical column subjected to longitudinal vibrations produced an increased flow. Further modifications in the experimental set-up are needed to simulate the reduced blood flow due to HAVS.

Vibration Analysis of Finger Using Non-linear FEM to Understand HAV Syndrome

Shrikant Pattnaik, Jay Kim
Department of Mechanical Engineering
University of Cincinnati

Hand-arm vibration syndrome is a major Musculoskeletal Disorder (MSD) that often affects construction workers and miners, due to exposure to excessive vibration. Disorders include significant changes in morphology and abnormal vascular and neurological functions. Vibration White Finger (VWF) disease being one of the many MSD that has significant local detrimental impact on fingertip, having effect such as blanching, numbness and pain. The precise pathogenesis of these changes in hand arm vibration syndrome remains unclear and knowledge pertaining to the effects of confounders, such as cold exposure, smoking habits and individual susceptibility is also deficient. Guidelines for HAVS have been developed mainly relying on the population study and empirical tests which provide only limited information. Especially for hand and fingers, a direct animal test is not a practical option. Therefore a numerical analysis will be very useful in study of HAVS for this reason. This research reports development of an analysis procedure and related techniques for hand and arm vibration study using finite element analysis. Where a static and dynamic response of fingertip is investigated when subjected with grip force and tool vibration. Results including frequency response and mode shapes indicate the nature of force transmission and strain pattern in the tissue with respect to frequencies and magnitude of induced vibration, which is used to relate and understand possible cause of HAVS.

Workplace Incivility as a Threat to Safety Behaviors among Nurses

YoungAh Park, Purnima Gopalkrishnan, Steve M. Jex, Jennifer Ellen Yugo
Psychology Department
Bowling Green State University

Workplace incivility is a “milder” form of interpersonal mistreatment at work (Andersson & Pearson, 1999). Workplace incivility is conceptualized as a psychosocial stressor at work that has negative effects on employee well-being and job attitudes. This pilot study tested a model linking workplace incivility to safety behaviors of incivility targets employing a cross-sectional survey design with self-report and coworker report. The results from surveying 190 Registered Nurses in the state of Ohio and their 75 coworkers showed that receiving uncivil treatments at work from various sources (i.e., coworkers, supervisors, physicians, patients and visitors) was related to frequent feelings of negative affect on the job (e.g., feeling annoyed, frustrated etc.). Nurses with frequent feelings of negative affect on the job were less likely to show safety participation behaviors. Based on the present findings, future research needs to confirm the causal relationships using a longitudinal design with multi-source reports (e.g., supervisor report, organizational records) as well as investigate the factors that can mitigate the negative effect of incivility. This line of research will enhance occupational health and safety for the nursing population who are at risk for accidents and injuries.

Exploring Adolescent Employees' Perceptions of Safety from Workplace Violence

Carolyn R. Smith[1], Donna M. Gates[1, 2], Gordon L. Gillespie[1], Theresa A. Beery[1]
[1]College of Nursing, [2]College of Medicine
University of Cincinnati

Purpose: To explore adolescent employees' perceptions of safety from WPV, WPV specific training/ education, and awareness of WPV-specific policies at one chain of retail ice cream stores in one mid-Western city. **Methods:** Adolescent employees age 15-18 working at one of fourteen retail ice-cream stores were invited to participate in this exploratory qualitative-dominant mixed methods study. Three participants completed a 36-item survey and individual interviews exploring perceptions of safety from WPV. Descriptive statistics were used to analyze survey data and constant comparative analysis used to analyze interview data and the combined data sets. **Results:** All participants had experiencing at least one WPV behavior: 100% reported verbal harassment and 67% reported sexual harassment. Two-thirds of participants received WPV training and all participants were aware of at least one WPV policy. Qualitative themes indicated a lack of concern about WPV among participants. However participants reported past experiences with mild forms of WPV impacted immediate short-term psychological health and productivity. Mixed methods analysis found no distinct differences in themes among quantitative categories. Participants desired additional training and policies specific to situations of WPV. **Conclusions:** Preliminary findings indicate adolescents are not concerned about safety from most forms of WPV when at work. Based on our results, clear deficits in WPV training and education and awareness of WPV policies exist among adolescent employees. Study results were limited due to an extremely small sample size and on-going study recruitment.

Blood DNA Markers for Breast Cancer Associated with Heavy Metal Exposure

Xiang Zhang, Susan Pinney, Jing Chen, Shuk-mei Ho
Department of Environmental Health
University of Cincinnati

Breast cancer (BCa) is the second most common cancer among women in the United States. In the early 1950s, a plant for processing uranium (U) was built in Fernald, Ohio, which resulted in a threat of U exposure to the surrounding community. Studies indicated that among the exposed female residents, the incidence of BCa was 71% higher than that of the unexposed residents. However, rarely has an attempt been made to identify biomarkers for general population that have predictive abilities for BCa and heavy metal exposure a few years before diagnosis. We propose that differentially methylated DNA markers from blood samples can be used as predictors of BCa and heavy metal exposure. Using unique well-characterized cohort blood samples that are stored 2-3 years prior to the development of BCa, using the latest methylation array platform, we conducted CpG Island-Plus-Promoter Arrays to identify DNA methylation biomarker candidates associated with BCa, and identified 17 potential methylation markers, including Fam151a, Slc25a24 and Mrps21. Bisulfite sequencing analysis is on-going to verify the methylation status of the array identified candidates.

2010-11 PRP Awardees
POSTER PRESENTATION ABSTRACTS

The Effects of Bullying on Productivity and the Novice Nurse

Peggy A. Berry, Gordon L. Gillespie, Donna M. Gates, John Schafer
College of Nursing
University of Cincinnati

Workplace bullying has been linked to a myriad of adverse psychological and physical outcomes for both the experienced and novice nurse who has been the target of this negative behavior. Outcomes of workplace bullying include shame, self-blame, absenteeism, intent to leave, burnout, stress, avoidance, and increased absenteeism. Novice nurses are at high risk for these outcomes if workplace bullying is not prevented (Felblinger, 2008; Hutton & Gates, 2008; McKenna, Smith, Poole, & Coverdale, 2003; Salin, 2003; Simmons, 2008; Pellico, Brewer, & Kovner, 2009; Vessey, Demarco, Gaffney, & Budin, 2009). Yet, there is a fundamental gap in the workplace violence literature on the relationship of work productivity and workplace bullying against novice nurses.

The purpose of this study is to describe the problem of workplace bullying against the novice nurse and the resultant change in work productivity. The specific aims for this study are **(1) Determine the prevalence and frequency of workplace bullying, (2) Determine the change in work productivity of novice nurses following a workplace bullying incident, and (3) Identify the relationship of novice nurse characteristics (age, gender, and educational attainment) to workplace bullying and the change in work productivity**.

A descriptive, cross-sectional survey design using a web-based survey will be used to collect data on workplace bullying frequency, work productivity, and participant demographics. These data will be analyzed to identify the correlation between work bullying and workplace productivity in novice nurses using age, gender, educational attainment, and race as modifying variables. Prevalence and frequency of workplace bullying will be collected. A randomly selected sample of newly licensed (novice) nurses from Indiana, Kentucky, and Ohio will be used.

The National Occupational Research Agenda (NORA; 2009) identified the need for research focused on psychosocial factors, interpersonal conflict, and work-related violence. Understanding the frequency of workplace bullying and its relationship to work productivity is an essential step in recognizing the seriousness of workplace bullying on the mental health, physical health, and work productivity of novice nurses.

Firefighter Garment Based Carbon Foam Fabric

Ahmed Elgafy
School of Dynamic Systems, College of Engineering and Applied Science
University of Cincinnati

The proposed research work is a numerical study to investigate and predict the effect of utilizing different carbon foam fabrics as alternative materials for both outer shell and thermal liner layers in firefighter garments. Incorporating the advantages inherent in both cellular and carbonaceous materials, carbon foam has been considered as a material of great promise in a variety of applications. Rocket nozzles, advanced tooling, engine components, and as a core material in sandwich structures have all employed carbon foams due to their extremely light weight and optimum mechanical and thermal properties. Furthermore with a specific modulus rivaling that of a Kevlar hon-

eycomb, carbon foam has even been suggested as a replacement for a vast array of materials ranging from balsa wood and polymer matrices to metallic honeycombs and titanium for use in biological applications. According to its porosity and ligament structure, carbon foam would be utilized as an excellent insulator. On the other hand, every firefighter's turnout is a composite of three components: an outer shell, a moisture barrier and a thermal liner. The outer shell is designed to take the everyday abuse of firefighting. This outermost layer is designed to protect the inner components from thermal hazards, abrasion, sunlight and other factors involved in fighting fires. The moisture barrier layer, an impermeable liquid film laminate protects against the intrusion of water, chemicals or viral agents. The thermal liner provides the most thermal insulation by trapping air in either a traditional needle-punched batt or between multiple layers insulation. The durability of this layer is improved by quilting these materials. The combination of all three of these components will define the performance characteristics of the entire composite system. Thermal Protection Performance, total heat loss, system weight and many other criteria will define how a specific combination performs and feels. As a conclusion: by combing its inherent properties and its ability to be used in biological applications, carbon foam would be an excellent material to be used as the outer shell and thermal liner layers in firefighter's garment.

A Novel Low-cost Microsensor for Point-of-care Multi-gas Monitoring

Ian Papautsky,[1] Michael Ratterman,[1] David Klotzkin[2]
[1]Electrical and Computer Engineering, University of Cincinnati
[2]Electrical and Computer Engineering, University of Binghamton

The long-term goal of this project is to develop a miniature, portable, low-cost sensor for detection of multiple (toxic and nontoxic) gases specifically encountered by the firefighting, mining, and scuba diving industries. This proposal is our first step in achieving this long term goal and we thus begin with detection of nontoxic, yet critically important O2 and CO2 gases. Absorption-based infrared CO2 detectors and Clark-type O2 electrochemical sensors are the common methods for determining concentration of these gases in breathable air. These conventional methods pose numerous challenges such as degradation over time and high cost. Our strategy to developing the multi-gas sensor is to integrate the low-cost CMOS array detector with luminophores which fluorescent emission is quenched selectively by the target gases. We will use novel cross-polarization optical signal isolation concept to filter excitation light and dramatically increase sensitivity. We will use the different color channels of the CMOS array to selectively detect wavelength-specific (i.e. color- specific) emission of each gas-specific luminophore. Our team of engineers has already developed a preliminary proof of concept O2 sensor and has achieved promising results. We propose to build on these results and accomplish the following aims: 1) Demonstrate a portable O2 sensor, 2) Demonstrate a portable, optical CO2 sensor, and 3) Demonstrate simultaneous detection of CO2 and O2 gases**.**

The outcome of this project will be the first low-cost optical CMOS sensor capable of detecting multiple gases simultaneously. Ultimately, this technology can be scaled down to a small, wearable device or possibly integrated into existing clothing worn by firefighters or miners.

Workplace Culture: Psychometric Evaluation of the Nursing Culture Assessment Tool

Andrea Borchers[1], Susan Kennerly[1], Tracey Yap[1], Annette Hemmings[2], Gulbahar Beckett[2], John Schafer[1]
[1]College of Nursing, [2]College of Education
University of Cincinnati

The Healthcare and Social Assistance sector comprised an estimated 15 million paid workers in 2005. These workers face risks including overexertion, shift work, and psycho-social stressors. Prolific nurse and certified nursing assistant (CNA) turnover rates are a critical issue; this growing worker shortage seriously threatens the quality of care delivered and co-worker safety. The highest healthcare turnover rate occurs within the first 90 days of employment, making it difficult to provide a stable workplace culture and a consistent safety level. Organizational culture is believed to affect workplace safety, efficiency, and effectiveness, thus the need to promote retention of and successful performance of the nursing workforce. By better understanding the workplace culture and its effect on licensed nurses and CNAs, it will be possible to design intervention strategies to reduce psychosocial stressors, thus reducing turnover and its latent impact on workload and worker safety (illness and injury).

An interdisciplinary team of expert researchers has been assembled to pilot test and evaluate the psychometric properties of the Nursing Assessment Culture Tool (NCAT) in preparation for its use in assessing the work place culture of healthcare workers. This cross-sectional, exploratory investigation of the NCAT's psychometric properties builds on a prior study that established the NCAT's face and content validity. The specific aims of this research are to: test the psychometric properties of the NCAT; discover the dimensionality of the NCAT; and refine the item structure of the NCAT to be most representative of the construct of nursing culture. A sample will be randomly drawn from the Ohio Board of Nursing's list of licensed nurses (166,000 registered nurses, 52,000 licensed practical nurses) and the Ohio Board of Health's Nurse Aide Registry list of CNAs (80,000 state tested nurse aides). By establishing construct validity of the NCAT through this proposed research, the research team will be well positioned to pursue extramural funding to explore the causal links between culture change, worker safety, patient care outcomes, and worker turnover in healthcare organizations.

Tai Chi: A Possible Way to Reduce Cardiovascular Risk Factors in Firefighters

Jane Christianson, L. Sue Davis
College of Nursing
University of Cincinnati

Coronary heart disease (CHD) accounts for 39% of occupational fatalities in firefighters (Drew -Nord, Hong, & Froelicher, 2009; Geibe, Holder, Peeples, Kinney, Burgess, Kales, 2008; Lund, Taylor, & Herbold, 2001). According to the United States Fire Association 2009 report, "Firefighting is the Nation's most dangerous and hazardous job, with heart attacks, high stress levels, sprains and strains all too common" (p. iv.). Firefighters must maintain high levels of physical fitness in order to perform the duties of protecting public safety, therefore the firefighters' health and safety should be a priority to our nation (Drew-Nord et al., 2009).The prevalence of heart disease in firefighters has been well documented in the literature; however, research has not successfully reduced this trend. Because firefighting job activities vacillate between a physically demanding job and one of immeas-

urable sedentary time, intervention such as Tai Chi, may be beneficial in reducing the modifiable risk factors of inactivity and hypertension in this population. Tai Chi combined with nutrition and stress education significantly cardiac risk factors (Park et al., 2009).

Cyber and Face-to-Face Incivility and Employee Well-being: A Daily Investigation

YoungAh Park[1], Shuang-Yueh Pui[2], Steve Jex[1]
[1]Department of Psychology, Bowling Green University
[2]Department of Psychology, University of Illinois

The primary aim of this study is to examine an intra-individual model linking workplace incivility (a psychosocial work stressor) to daily employee well-being (negative affect, physical symptoms). Unlike past incivility research, this study is unique in two ways. First, it will examine the incremental negative effects of workplace cyber incivility through email (cyber incivility) on employees' well-being beyond the effects of face-to-face incivility given that email is one of the most frequently used media for work-related communication in many occupations and organizations. Second, breaking away from the typical cross-sectional between-subject designs, this study will employ a daily longitudinal within-subject design with a hierarchical linear modeling analysis, which will allow us to capture daily variation in experiencing cyber and face-to-face incivility and their effects on worker's well-being at the end of workdays. This study design will minimize the limitations associated with the heavy reliance on between-subject cross-sectional designs of the past research on incivility and well-being.

Samples will be recruited from the pool of state university alumni who hold full-time jobs and use emails in their workplaces for work-related communication. One-time general online survey will measure demographics and control variables, and short daily online surveys will measure the main study variables for five consecutive workdays from Monday to Friday. All participants will be awarded with a $50 electronic gift certificate in compensation for their participation in both general and daily surveys for five work days.

This will be the first study to investigate the potentially deleterious effect of cyber incivility on employees' well-being and daily dynamics of the relationships between incivility experienced and well-being. Results of this study will also apply to organizational policies, as well as developing interventions and training to reduce negative health effects of cyber and face-to-face incivility on workers.

Exposure Assessment and Real-time Evaluation of Surface Cleaner Dust Suppression Technology during Highway Construction

Beauregard Middaugh[1], Bryan Hubbard[2]
[1]School of Health Sciences, [2]Department of Building Construction and Management, Purdue University

The overall aim of the study is to evaluate an existing form of wet method technology and vacuum technology to decrease exposure to respirable dust and crystalline silica for operators of roadway surface cleaners. Although dust control technology is available for this application, it is not understood whether these technologies reduce exposures of the operators or surrounding workers. In order to evaluate the respirable dust controls, an exposure assessment will be performed to determine the percent silica reduction between the uncontrolled and controlled methods, as well as an im-

portant evaluation of productivity, highway construction usability, and worker preference.

The research objectives of the study will be to 1) determine the percent dust reduction of control technologies for roadway cleaning equipment, 2) compare measures of productivity such as the time it takes to clean a defined length of pavement, 3) qualitatively determine the usability of the system for roadway construction (e.g. whether or not water sources are accessible and readily available), and 4) analyze a questionnaire of worker preference in regards to the dust control method.

Reduction of Health-Care Worker Exposure to Pandemic Flu Virus in Hospital Rooms

Aravind Kishore, Urmila Ghia, Santosh Konangi
School of Dynamic Systems, Mechanical Engineering
University of Cincinnati

The aim of the proposed research is to develop recommendations for alternate ventilation-system configurations in Hospital Rooms (both in regular patient rooms as well as Airborne Infection Isolation Rooms (AIIRs)) so as to reduce the risk of Health Care Workers (HCWs) from contracting air-borne diseases from patients.

Air-borne pathogens are transmitted long distances when a patient coughs or sneezes. HCWs are placed at a high risk, especially when the HCW is performing cough-generating procedures on the patient in the same room. Using Computational Fluid Dynamics, we aim to simulate the dispersal of air-borne pathogen from a patient who is within a hospital room, track the pathogen-carrying droplets, and investigate the effects of the ventilation-system configurations that are in place. For the present study, we will consider two configurations, a regular patient-room and an Airborne Infection Isolation Room (AIIR) at the University Hospital, Cincinnati.

Our results will indicate the effectiveness of the in-place ventilation systems in diluting/ removing the airborne pathogen from the vicinity of the patient and the HCW. In addition, based on our results, recommendations for alternate ventilation-system configurations will be made.

A Pilot Study: Body Damping and Bone Fracture

Ozan Akkus[1], Hiroki Yokota[2], Alexander Robling[2], Nelson Watts[3]
[1]Department of Biomedical Engineering, Purdue University,
[2]Department of Biomedical Engineering,
Indiana University/Purdue University at Indianapolis,
[3]Bone Health and Osteoporosis Center, University of Cincinnati

The objective of this pilot project is to establish a potential linkage of mechanical damping capacity of a body to a likelihood of bone fracture. A recent set of clinical data collected by Drs. A. Bhattacharya and N. Watts indicates that a group of human subjects with high incidence of bone fracture have a low damping factor (zeta value). This intriguing dataset suggests a potential, non-invasive diagnostic tool for evaluating susceptibility of bone fracture. However, since fractured bone apparently presents a high zeta value, the mechanism underlying an observed low damping factor in the fracture group is unknown. In order to resolve this apparent discrepancy between damping capacity and fracture susceptibility, we propose to test a hypothesis: Low damping of bone surrounding tissues such as muscle and body fat leads to high incidence of bone fracture.

To test the hypothesis, the following specific aims will be investigated using a mouse tibia loading model:

- Determine zeta values and bone fracture loads in a group of mice with and without surrounding tissues.
- Examine a potential correlation between zeta values and fracture loads when the surrounding tissues are present.

Loading experiments will be conducted in Dr. A. Robling's lab at IU School of Medicine with assistance of Dr. H. Yokota at IUPUI, and data analysis will be conducted in Dr. O. Akkus' lab at Purdue University. Dr. N. Watts at U. of Cincinnati will provide assistance in data interpretation. If successful, the results will be used to develop an inter-campus NIH proposal that is expected to contribute further investigating the mechanism for a non-invasive clinical tool.

Effect of Aging on Human Postural Control: A Predictive Modeling Approach

Renu Sah[1], Amit Shukla[2]
[1]Department of Psychiatry, University of Cincinnati
[2]Department of Mechanical and Manufacturing Engineering, Miami University

Falls are a serious medical and public health problem facing adults aged 65 and older. Falling to the side is has been identified as an important causal factor for hip fracture, which is associated with up to 20% chance of death. Aging appears to present particular problems for lateral balance related to falls. A better understanding of the mechanisms underlying falls would be significant in designing risk assessment or interventions towards fall prevention. Further, this could lead to a diagnostic and prognostic tool for balance disorders. The aim of this research is to develop a model for the effect of aging on postural control based on clinical data (available in literature and at UC Center for Neuroscience). This model will provide a basis for future development of a diagnostic and prognostic tool for balance disorders triggered due to aging such as Parkinson's disease. Human balance is critical to many aspects of our daily lives. Even the act of standing quietly requires a complex integration of multiple sensory inputs, decision processes, and motor planning. For many of us, these complicated control processes generally work well and are consequently taken for granted. However, balance disorders can be a serious and significant health problem that cuts across ethnic and socioeconomic groups. The *goal* of this project is to conduct a detailed numerical study of the nonlinear dynamics and stability of human posture using nonlinear system analysis tools (e.g. bifurcation theory) using low-order models. Further, using existing literature and published data a normal form model of the effect of aging and balance disorders will be integrated into the low-order models. Ultimately, this project will result in an enhanced understanding for advanced diagnostic and prognostic approaches related to human balance disorders. The long-term goal of this research is to develop novel ideas for the cooperative use of nonlinear dynamical systems theory in neurosciences and medicine with specific focus on balance disorders.

Cardiac Contractility and Oxygen Consumption in Work-related Heat Syncope

Thad E. Wilson, Richard Klabunde
College of Osteopathic Medicine
Ohio University

People in occupations such as firefighting, as well as road repair, construction, mine, foundry, and bakery work, can experience extreme heat stress while performing work tasks in the upright position. Epidemiological data report incidence rates between 10-38 heat exhaustion cases per 100,000 in workers or soldiers in heat stress environments. Heat syncope is a distinct form of heat exhaustion and is related to postural pooling of blood, decreases in venous return, reductions in cardiac output, and cerebral ischemia. The causes and mechanisms of heat syncope are unclear; we believe there is an increase in left-ventricular contractility but not to an extent enough to prevent a fall in stroke volume during low-to-moderate reductions in preload that are associated with heat stressed humans in the upright position.

The purpose of this pilot proposal is to identify the effect of heat stress on cardiac contractility and myocardial oxygen consumption while independently altering the variables that affect cardiac function in a manner consistent with the development of work-related heat syncope. An isolated rodent heart model will be used to test study hypotheses because human laboratory studies can only manipulate physiological variables to the point of pre-syncope, but field studies and heat exhaustion hospitalizations report more extreme physiological changes during heat syncope which can only safely be performed in the isolated heart model. Our central hypothesis for this project is that moderate heating increases left-ventricular contractility in the isolated heart model either directly (heating alone) or indirectly via interactions with a β-adrenergic agonist (isoproterenol). These data will be informative as to the cardiac role in heat syncope and thereby lead to a combined mechanistic and applied translational research proposal to NIOSH dealing with work-related heat syncope etiology and countermeasure development.

NOTES:

2009-10 PRP Steering Committee Members

Dirk Yamamoto, PhD, Maj.,USAF	**Air Force Institute of Technology**
Steve Jex, PhD	**Bowling Green State University**
Cadence Lowell, PhD	**Central State University**
D. Gary Brown, PhD	**Eastern Kentucky University**
Carolyn Harvey, PhD	**Eastern Kentucky University**
Betty H. Olinger, EdD, RN	**Kentucky State University**
Robert Durborow, PhD	**Kentucky State University**
David Kraemer, PhD	**Murray State University**
Diana Schwerha, PhD	**Ohio University**
Gary Weckman, PhD	**Ohio University**
Frank Rosenthal, PhD, CIH	**Purdue University**
Neil Zimmerman, PhD	**Purdue University**
Amit Bhattacharya, PhD, CPE	**University of Cincinnati**
L. Sue Davis, RN, PhD	**University of Cincinnati**
Judy Jarrell, EdD	**University of Cincinnati**
Jay Kim, PhD	**University of Cincinnati**
Tiina Reponen, PhD	**University of Cincinnati**
Carol Rice, PhD, CIH	**University of Cincinnati**
C. Sue Ross, PhD, MD, JD	**University of Cincinnati**
Henry Spitz, PhD	**University of Cincinnati**
Glenn Talaska, PhD, CIH	**University of Cincinnati**
Tracey Yap, RN, PhD	**University of Cincinnati**
T. Scott Prince, MD, MSPH	**University of Kentucky**
Farhang Akbar-Hhanzadeh, PhD	**University of Toledo – Medical Science Campus**
Sheryl A. Milz, PhD, CIH	**University of Toledo – Medical Science Campus**
Emmanuel Iyiegbuniwe, PhD	**Western Kentucky University**

NOTES:

A SPECIAL THANKS TO THE FOLLOWING INDIVIDUALS FOR MAKING THIS YEAR'S PRP SYMPOSIUM A SUCCESS!

Leslie J. Ungers
Of Ungers & Associates, Inc.
President of the Academy of Kettering Fellows

We are especially grateful to the Academy of Kettering Fellows for their continued support of the Annual PRP Symposium and for sponsoring the Annual Networking Picnic

PRP Symposium Planning Committee
Amit Bhattacharya, Ph.D., CPE—Program Director
Cyndy Cox, PRP Program Coordinator
Kurt Roberts, IT Manager
Marianne Kautz, Program Coordinator, Continuing Education
Stephanie Starkey, Graduate Studies Program Coordinator
Amy M. Itescu
Kathy McCann

ERC Graduate Student PRP Committee

Mainerd Sorensen	**Joe Kluener**	**Peter Sandwall**
Bernie Rudd	**Kristin Musolin**	**Nick Newman**
Eric Glassford	**Jay Bernstein**	**Todd Ramsey**
Adriane Eastlake	**Kevin Dunn**	**Kevin He**
Chris Sparks	**Ashutosh Mani**	

Caterering for the PRP Networking Picnic
Ollie's Trolley
Marvin Smith, Owner
(513) 238-3403

University of Cincinnati
EDUCATION AND RESEARCH CENTER

PILOT PROJECT RESEARCH TRAINING PROGRAM

Supported by the National Institute for Occupational Safety and Health (NIOSH)

PARTICIPATING UNIVERSITIES

AIR FORCE INSTITUTE OF TECHNOLOGY
BOWLING GREEN STATE UNIVERSITY
CENTRAL STATE UNIVERSITY
EASTERN KENTUCKY UNIVERSITY
KENTUCKY STATE UNIVERSITY
MURRAY STATE UNIVERSITY
OHIO UNIVERSITY
PURDUE UNIVERSITY
UNIVERSITY OF CINCINNATI
UNIVERSITY OF KENTUCKY
UNIVERSITY OF TOLEDO—HEALTH SCIENCE CAMPUS
WESTERN KENTUCKY UNIVERSITY

University of Cincinnati Education and Research Center
Supported by: National Institute for Occupational Safety and Health (NIOSH)
Grant #: T42/OH008432-05

Department of Environmental Health
Kettering Laboratory, Suite 112
3223 Eden Avenue, ML 0056
Cincinnati, Ohio 45267-0056
Phone: (513) 558-5710 ◇ Fax: (513) 558-2722
Website: www.eh.uc.edu/erc