**Personal Exposure of Farmers to Airborne Pollen and Fungal Spores During Different Agricultural Activities**

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There have been very few studies on personal exposure to aeroallergens like fungal spores and pollen, particularly with agricultural farm workers. The overall objective of this study was to measure the personal exposure of farmers to aeroallergens in occupational agricultural environments using the Button Personal Inhalable Sampler, which has recently demonstrated a good performance for collecting outdoor aeroallergens. Personal exposures to airborne fungal spores and pollen were measured for three persons during animal feeding activities in a hog farm using Button Personal Inhalable Samplers. Simultaneously, the stationary measurements of same aeroallergens were performed using a Burkard 7-day recording Volumetric Spore Trap, one revolving Button Sampler and five stationary Button Samplers. Personal exposures for total fungal spores ranged between 20,440 and 27,526 spores per cubic meter of air (spores/$m^3$) and the range for total personal pollen exposure was 0-36 pollen/$m^3$. The stationary measurement of total airborne fungal spores by the conventional widely used Burkard Spore Trap was 6,427 spores/$m^3$, and for pollen, the respective concentration was 60 pollen/$m^3$. On the other hand, stationary sampling by five Button Samplers demonstrated higher concentrations of fungal spores (range: 14,172-35,975 spores/$m^3$) and pollen grains (range: 18-90 pollen/$m^3$) compared to the Burkard Spore Trap and personal measurements by Button Samplers. Altogether 22 types of airborne mold spores and 5 types of airborne pollen were collected during the animal feeding activities. Predominant airborne spore types were: spores of Aspergillus/Penicillium group, Cladosporium, Alternaria, smut spores (Ustilaginales), Epicoccum, and Torula. Among different pollen types the grass pollen was most common. The study concluded that: i) rich fungal airspora existed in the rural hog farm during the animal feeding activities, however, only few airborne pollen types were recorded; ii) the concentration levels of fungal spores and pollen at the hog farm was much higher than a normal outdoor environment like the Cincinnati metropolitan area recorded on the same day (total fungal spores: 6,177 spores/$m^3$; total pollen: 6 pollen/$m^3$). iii) for fungal spores, the Button Sampler collected (both for personal and stationary sampling) about four to five times higher amount of airborne fungal spores than the conventional Burkard Spore Trap, however, for pollen it collected slightly lower amount in most cases (except for the Button Samplers at central and revolving positions). iv) the levels of personal exposure (20,440-27,526 spores/$m^3$ and 0-36 pollen/$m^3$) were slightly lower than the stationary measurements by the Button Samplers (20,713-35,975 spores/$m^3$ and 18-90 pollen/$m^3$), however, no statistically significant difference was detected ($p>0.05$). This observation indicates that the Button Personal Inhalable Sampler can be used in a stationary mode for detecting the personal exposures of bioaerosols (particularly, airborne fungal spores) in agricultural occupational environments. The future direction of this study will provide more personal and stationary exposure data from two more agricultural field sites for strengthening these four conclusive statements.

**Prediction of Postural Stability in the Workplace**

**Ali A. Minai, PhD, Associate Professor, Electrical and Computer Engineering and Computer Science( ECECS), Kermit G. Davis, PhD, Assistant Professor, Occupational Safety and Ergonomics, and Jayaram Venkatesan, ECECS– University of Cincinnati**

Prediction and prevention of falls is a very important part of creating safe and productive workplaces. The risk of falling during workplace activity is related to postural stability. However, assessing postural stability during task performance is difficult, and requires elaborate testing that is both expensive and risky. The research proposed here considers the possibility of using postural data obtained under much simpler testing conditions to predict postural stability during workplace tasks.

The specific aims of the proposed research are:

1. Applying techniques derived from nonlinear systems theory and information theory to posture data time series obtained under static test conditions in order to predict dynamic postural stability in the workplace environment.
2. Using neural networks and other multivariate pattern recognition methods to develop and validate a model for identifying individuals at risk for falling during workplace tasks.

The approach proposed for this research uses techniques from multivariate statistical analysis, pattern recognition, and nonlinear systems theory. A large suite of statistical, spectral and dynamical measures will be calculated from stabilograms obtained under upright stance and task conditions in the presence of various risk factor combinations. The number of these measures will then be reduced through statistical analysis to obtain those most predictive of postural instability during task performance. Finally, adaptive pattern recognition methods --- especially neural networks --- will be used to obtain a model embodying the relationship between postural stability measures under upright stance and dynamic task conditions. The model will be validated statistically using experimental data

**Pulmonary Function Test (PFT) Effects in Rescue Workers at 'Ground Zero'**

**Brian W. Case, MD, Resident**
**Occupational and Environmental Medicine – University of Cincinnati**

In response to the September 11, 2001 terrorist incident in New York City the Federal Emergency Management Agency(FEMA) commissioned 28 Urban Search and Rescue(USAR) teams from multiple states to participate in the search, rescue, and recovery of victims. The Ohio Task Force One(OH-TF1) is one of the 28 USAR teams which responded by sending 76 of its members to the work site who spent seven days there. Contaminants potentially present at the World Trade Center Site include benzene, biohazards, chromium, diesel fumes, dioxins, freon, lead, mercury, particulate matter, polychlorinated biphenyls, sulfur dioxide, and most notably asbestos and alkaline dust. Unfortunately, respiratory protection was inadequately used due to disorganization, refusal, lack of training, lack of supply, and lack of proper fit-testing. Many workers reported immediate symptoms of cough, fatigue, eye irritation, nasal irritation, and sore throat. In the months following, rescue workers were more likely to seek medical care than their non-deployed colleagues. There have been reports of reduced exercise capacity, adult-onset asthma, and pneumonia. A current screening program includes pulmonary function testing for all WTC volunteers without a known control group. This study will provide a matched control group from Ohio that were not deployed, as non-deployed personnel based in New York City may not be available or appropriate.

The aim of this study is to determine whether FEMA members who were deployed have observable decrements in pulmonary function testing versus those who were not deployed. The methods for achieving this goal will involve spirometric assessment of lung volumes. The exposure and control group will be compared against each other and statistical methods will be employed in order to detect a significant difference.

**Viable Fungal Concentration on HVAC Filters as a Predictor of Building Occupant Respiratory Symptoms and of Average Airborne Fungal Concentrations**

**Venkat Venkatasubramanian, PhD, Associate Professor and Chunhua Zhao, PhD, Postdoctoral Research Asso., Chemical Engineering – Purdue University**

Occupational safety and health are very important issues in process industries. As modern chemical plants have become large and extremely complex, it has become very difficult to analyze and assess in detail the inherent hazards in the plants, to effectively and safely manage changes, to perform maintenance safely, to better control of abnormal events online, and to effectively train operators. The federal government, through OSHA and EPA, has responded to the public's concern on process safety with regulations that require a mandatory and periodic PHA review of both continuous and batch chemical plants. Hazard and Operability (HAZOP) analysis is the most commonly practiced PHA methodology. HAZOP analysis is the study of systematically identifying every conceivable deviation from normal plant operation, and finding all the possible abnormal causes and the adverse hazardous consequences of those deviations. An automated approach is needed as HAZOP analysis is a difficult, labor-intensive and time-consuming. An automated approach can cut down on the time and effort involved in performing a safety review, make the review more thorough, detailed, and minimize or eliminate human errors. PHA is knowledge intensive, and the analysis capacity and quality of the automated system depend exclusively on the quality of domain knowledge. It is impossible and impractical to encode all kinds of knowledge into the knowledge base during development phase of the automated system. Thus, the major aim of this proposal is to address the important practical learning needs using advanced AI and Information Technology (IT) concepts, techniques and tools. Open architecture to cope with complex structure of safety knowledge, and learning-from-experience strategy by using case-based reasoning (CBR) methodologies, will be investigated in this project.

**Patterns of Cistern Drinking Water Use in a Semi-Rural Community for Exposure Assessment**

**Emma-Jane Fennell, Industrial Hygiene Graduate Student; Scott Clark, PhD; Susan Pinney, PhD; Linda Levin, PhD**
**Environmental and Industrial Hygiene, – University of Cincinnati**

A pilot study was undertaken to determine patterns of cistern water use for drinking water consumption as part of the Fernald Medical Monitoring Program (FMMP). The FMMP was established in 1990 as part of the settlement awarded to citizens living adjacent to the U.S. Department of Energy Feed Materials Production Center (FMPC) in Fernald, OH. Contamination of ground water, and subsequent contamination of well water sources, has previously been considered in exposure assessment. However, there has been minimal research into the potential for exposure to airborne contamination via cistern water consumption. During FMPC operation from 1952-1988, it is estimated that 310,000 kilograms of airborne uranium dust/particulate was emitted into the atmosphere. Of the 9709 participants in the FMMP 28.4% had reported in an earlier study that they used cistern water for drinking. The goal of this study was to obtain descriptive statistics of cistern drinking water use to include in exposure assessments for the population surrounding the FMPC.

611 questionnaires were sent to FMMP participants, who reported cistern use and lived within a 2-mile radius of the plant, to collect information on cistern water use. 341 questionnaires were returned for a return rate of 56%. Analysis showed that 81.8% of these households reported cistern water as their sole source of drinking water, indicating that cisterns may have represented a significant exposure route. The use of filtration systems for cistern water prior to water consumption was limited, with only 27.7% reporting their use. The use of external water supply to refill cisterns during low rainfall periods was considered as a potential source of dilution or further contamination of the cisterns. Frequency of cleaning and water treatment was also determined. Overall, the pilot study showed that cistern water consumption could be a contributor to exposure.

**The Study of Applicability of Activated Carbon Fibers (ACF) for Removal of Volatile Organic Compounds (VOCs) in Indoor Environments**

**Neil Zimmerman, PhD, Associate Professor, and Huajun Lu, Industrial Hygiene Graduate Student, School of Health Sciences – Purdue University**

Indoor air quality (IAQ) is an issue of rising concern in the United States. Concern about IAQ is driven mainly by the health problems caused by volatile organic compounds (VOCs), gaseous contaminants, respirable particulates and bioaerosols. Indoor VOCs contribute significantly to Sick Building Syndrome (SBS). The symptoms of which include irritation of eyes, nose, and throat, erythema, mental fatigue, headache, nausea and dizziness. This research will focus on examining the applicability of indoor VOCs adsorption onto activated carbon fibers. The goals of this research are: 1). To examine the applicability of ACF for removal of selected typical VOCs at indoor concentrations by experiments; and 2).To develop suitable theoretical models for predicting breakthrough time and adsorption capacity of ACF.

In this study, the dilution air from house air will be passed through a zero air generator (Matheson Model MGEN-ZRC 3500, 3.5 lpm) to generate purified air which contains less than 0.lppm hydrocarbons measured as methane. Relative humidity can be controlled by adjusting the ratio of the air entering the pressure regulator directly and the air entering water impingers. Three common VOCs with different boiling points and different polarities-toluene, limonene and acetone-will be used in this project. VOCs are generated by permeation devices in which chemical emission rates are determined by water bath temperature. Adsorption capacities of activated carbon for three VOCs will be investigated individually in the concentration range of 100ppb to IOppm. VOC contact time with activated carbon will be investigated in the range of 0.05 to 0.2 seconds. Relative humidity effect on adsorption efficiency will be examined from 10% to 90%. Adsorption properties of activated carbon for VOC mixtures will also be tested in this project. Concentrations of VOCs will be analyzed by Varian GC Analyzer Model 3 900 with a HP-1 capillary column (with dimensions of 30m*0.53mm, I.D* 1.5um) equipped with a flame ionization detector. Air samples will be collected by syringes at two sampling ports before and after the adsorption column.

The outcome of this study will test the applicability of activated carbon in indoor applications in term of breakthrough time and adsorption capacity. Suitable models for predicting breakthrough time and adsorption capacity will be developed. The knowledge gained in this study could directly apply to the question of protection of occupants on in buildings with long-term low VOC emission.

## Viable Fungal Concentration on HVAC Filters as a Predictor of Building Occupant Respiratory Symptoms and of Average Airborne Fungal Concentrations

**Neil Zimmerman, PhD, Associate Professor, and Hernando Perez, Industrial Hygiene Graduate Student, School of Health Sciences – Purdue University**

Airborne fungi and their spores are associated with asthma, hay fever and hypersensitivity pneumonitis. While it is known that indoor airborne fungal contamination causes adverse health effects in building occupants, there is no well-established, universally accepted method to accurately detect and quantify this contamination.

In this study, viable fungal concentrations on building HVAC filters will be quantified and compared with viable single stage impactor sampling results, occupant symptom questionnaires, building walkthrough inspections and building histories. Filter processing involves the following steps, 1) removal from the system, 2) cutting out of multiple small samples representative of the entire filter surface, 3) sample immersion in 0.9% sterile saline, 4) shaking of the filter/saline solution and 5)

plating out aliquots of the shaking solution on solid growth media. The inoculated media plates are then incubated at room temperature for 96 hours at which time colonies are counted.

Preliminary use of the quantification method has produced results suggesting that further investigation of the method is merited. In a comparison between complaint and non-complaint university building HVAC filters a greater number of mold spores were found on the complaint filters (566 colonies) than on the noncomplaint filters (215 colonies). The two filters were in place over the same six-month period and each served a different area within the same building. These results were statistically significant at a=.05 ($p<0001$). The obtained results suggest that the occupants of the complaint area were exposed to higher concentrations of fungal spores over the six-month period that the filters were in service. This potentially higher exposure, along with the fact that previous indoor air quality investigations found no explanation for the complaints, suggest that exposure to fungal spores may have played a role in triggering occupant symptoms.

At the completion of this research the quantification procedure will have been performed on a large sample of buildings. It is expected that analysis of the obtained data will suggest a statistically significant positive relationship between the number of fungi removed from the HVAC filters of a particular building and the occurrence and severity of respiratory symptoms experienced by occupants of that building. It is also expected that the number of fungi removed form the building HVAC filters will be significantly associated with various indicators of elevated mold presence.

**Aerosolization of Fine Particles from Metalworking Fluids Contaminated with Microorganism**

**Hongxia Wang, Doctoral Student and Tiina Reponen, PhD, Associate Professor Environmental and Industrial Hygiene – University of Cincinnati,**

Health effects associated with metalworking fluid (MWF) exposures include dermatitis, respiratory symptoms, hypersensitivity pneumonitis and asthma. About 1.2 million workers in the United States are occupationally exposed to MWFs. However, no sufficient information has yet been collected on the composition and concentration of airborne microorganisms at MWF sites. Our preliminary study showed increased aerosolization of fine particles from semi-synthetic MWF contaminated with Pseudomonas fluorescens. We hypothesize that these fine particles may contain biologically active components and contribute to the adverse health effects that are related to metalworking fluid exposures. Due to their small size, the fine particles may be even more biologically active than the larger particles. In this pilot study, we propose to study the effect of different types of MWFs on the aerosolization of fine particles from MWFs inoculated with microorganism, and the biological activity of these fine particles. The aerosolization of fine particles from different MWFs will be conducted in a modified experimental setup which was originally built up for another ongoing project. The number concentration and size distribution of the aerosols will be measured using direct reading particle measurement instruments. The large particles and fine particles will be collected on separate filters in an electrical low pressure impactor. The filter samples will be analyzed using limulus amoebocyte lysate ( LAL ) assay method in collaboration with Dr. Lewis of NIOSH, Morgantown. This study will provide pilot data on the aerosolization efficiency and biological activity of fine particles from MWFs inoculated with microorganism. These data are needed for the preparation of a large grant application to NIOSH.

**Multi-Fractal Analysis for Occupational Health Research**

**Jay H. Kim, PhD, Associate Professor, Mechanical Industrial and Nuclear Engineering – University of Cincinnati,**

The wavelet based multi-fractal Formalism (WMFF) will be developed and applied to study occupational health signals. The WMFF is one of recently developed advanced time-frequency signal analysis techniques. The time-frequency signal analysis is necessary to understand and evaluate real-life events such as bio-medical signals that are always transient. Most real-life events include some singular and random aspects. the WMFF enables to capture minute, however crucial signatures of the event, which cannot be captured by other signal analyses techniques. Specific applications to be studied in this proposed research are worker's motion analysis and the environmental noise analysis. In the motion analysis, the human postural balance time history will be studied to understand the conditions when workers lose postural balance. In the noise analysis, it will be attempted to quantify subjective metrics such as the annoyance and hazard level of the noise. The result may be incorporated in the future occupational noise regulations.

The WMFF based signal analysis method to be developed will be integrated to a versatile time-frequency signal analysis system bu combining with the Small Time Fourier Transform (STET), Wigner-Ville Transform, and wavelet analysis, which the PI has developed over the years. The WMFF method will allow qualitative characteristics of the signal to be identified in quantitative terms such as the regularity (conversely singularity) and the roughness of the signal. The WMFF technique will be improved, refined and customized to apply to analyses of the signals encountered in occupational health research such as the postural balance, eye motions and machine tool noise signals. Relationship of the signal anaysis result and conditions of critical development of the event, such as losing balance, will be studied. Developing the improved signal analysis software, reporting the application results, and identifying broader applications are specific aims.

**Health Impacts of Occupational Prolonged Standing**

**Kari Dunning, PhD, PT, Assistant Professor**
**Rehabilitation Sciences – University of Cincinnati**

Limited epidemiological and ergonomic studies have shown certain health outcomes to be associated with occupational prolonged standing including low back pain, leg and foot pain, hip osteoarthritis, chronic venous disease and insufficiency, varicose veins, artherosclerotic progression, increased plantar pain pressures, and increased leg internal fluid volume. Most studies have been performed outside the United States and, to our knowledge, no similar studies have been performed in the automotive industry.

The purpose of this proposed retrospective cohort study is to 1) evaluate the prevalence of pain symptoms and medical conditions of lower extremities, 2) evaluate the prevalence of jobs with exposures to prolonged standing in a confined posture, and 3) determine the exposure response relationship between pain symptoms, medical conditions and prolonged standing in the workplace. This proposed study will take place at the Navistar International Truck and Engine Corporation in Springfield, Ohio. This population offers a unique opportunity. Due to economic changes in the past two years, Navistar has been forced to reduce their work staff resulting in only the most senior workers remaining; currently, the youngest worker is 52 years old and all workers have been working in this same environment for a minimum of 32 years. This situation allows a unique glance at an older working population that has been exposed to prolonged standing for many years.

Data will be collected by mailed questionnaires to all eligible Navistar employees. On site evaluation will include interviews with personnel, plant walkthroughs, and objective exposure assessments in a randomly selected sub-sample of workers.

**Developing a Health Beliefs Model for Intervention Effectiveness in Automechanics**

**Glenn Talaska, Ph.D. University of Cincinnati and Marilyn Gardner,**
**Ph.D., Western Kentucky University**

Auto mechanics are at increased risk for several cancers including lung and urinary bladder. Used gasoline engine oils (UGEO) have been shown to contain significant levels of polycyclic aromatic compounds (PAC) and contribute to increased levels of PAC-DNA adducts in skin lung and urinary bladders of animals and humans exposed. We have seen that a simple intervention consisting of an educational session and provision of appropriate cleaning materials led to a overall reduction in exposure and biomarker levels in a small study of auto mechanic trainees. The focus of this proposal with be to better target the intervention to the group at risk using a health beliefs model, a survey instrument and focus groups. The population studied will be a group of 20 working auto mechanics in the Cincinnati, Ohio area. These persons have recently participated in a pilot study of biomarkers of PAC and UGEO exposure as part of an intramural NIOSH research study. The specific aims are: 1.) Develop a health based beliefs and susceptibility survey tool for automobile mechanics. This tool will explore and identify the perceive barriers to implementation of health improving behavioral changes and the risks of on-intervention, i.e., exposure; 2.) Field test this instrument with participants in a pilot exposure assessment that is currently taking place in Cincinnati; 3.)Conduct focus groups with the same participants to identify the media (trade magazines, Internet, popular magazines and news media (radio, television and periodicals)) that are viewed as most credible and reliable for presentation of health and intervention information. This study will provide baseline data on health beliefs and intervention strategies and media formats that will be used in a larger study of the impact of exposure interventions in auto mechanics.

**Using Work Sampling as an Alternative Methodology for the Assessment of Work Factors Leading to Musculoskeletal Symptoms**

**Nancy M Daraiseh Graduate Student, Ash Genaidy, PhD, Richard Shell, PhD, Department of Industrial Engineering and L. Sue Davis, PhD, College of Nursing, University of Cincinnati**

The objective of this research is to provide a guideline for reliable assessment of work factors leading to musculoskeletal symptoms in single and multiple body regions among nursing personnel.
The study as a whole provides a multi-faceted approach to assessing these types of outcomes. Prevalence rates for single and multiple body regions have been determined in conjunction with an assessment of the significant factors associated with musculoskeletal symptoms through the use of questionnaires (DS-94 and OIC11). These factors primarily consist of individual and lifestyle factors as well as workrelated factors (physical, mental or socio-organizational). Potential associations between the onset of symptoms in multiple body regions have also been studied.
The next stage in this investigation requires the implementation of a work sampling study. Work sampling is proposed as an alternative methodology used in conjunction with questionnaires to assess the possible associations between significant work related factors and the onset of musculoskeletal symptoms. The purpose of work sampling is to investigate the proportions of total time devoted to the various activities that constitute a job or work situation. This technique is generally used in industry to analyze jobs that appear to possess no repetitive pattern. The observer records the specific activity of the worker i.e. nursing personnel, at selected times over a full work shift. At the end of the shift the proportion of time devoted to certain nursing activites is calculated. If the activites found with the highest proportions in the work sampling study positively correlate with the activities significantly associated with musculoskeletal symptoms, this would possibly contribute to the validity of the instrument used to assess these symptoms. Accuracy of the data is dependent on the ability of the researcher to record exactly what activity is taking place when the selected time occurs.
Relevance to NORA
Musculoskeltal disorders, low back disorders, and organization of work are the primary targets of this investigation.

**How Do Home Health Nurses Deal with Care Errors?**

**Said K. Abu-Salem, Doctoral Student, and Juliann G. Sebastian, PhD,
Professor, College of Nursing– University of Kentucky**

The purpose of this study is to assess how home health nurses perceive and cope with health care errors. The Institute of Medicine report on medical errors in November 2000 brought this issue to the public's attention and has resulted in an increased effort to reduce medical errors. This report indicated that between 44,000 to 98,000 people die each year due to medical errors in hospitals. The cost of medical errors is approximately $37.6 billion each year; $17 billion has been attributed to preventable errors (IOM, 1999). Unfortunately, data are not available on the extent of the problem outside the hospitals. Home health nurses in Kentucky will be surveyed to determine how they perceive and cope with errors. A modified version of a survey that was originally developed by Wu and colleagues (1991) will be used. Kentucky Home Health Association will provide a list of home health agencies names. The directors of home health agencies will be contacted to obtain their agreement and support for the study. The investigator will send the sealed surveys to the directors of participating home health agencies who will distribute the surveys nurses in their agencies. Participants will provided with self-addressed envelopes and asked to return the envelop within two weeks. Survey data will be entered into Excel and exported to SPSS for analysis.

**Characterization of Size Distribution of
Released Fungal Propagules from Contaminated Surfaces**

**Seung-Hyun Cho, Doctoral Student and Tiina Reponen, PhD, Associate Professor, Department of Environmental Health – U of Cincinnati**

Several field studies based on conventional fungal spore counting have not revealed any significant differences in fungal spore concentration between mold problem and non-problem buildings. This indicates the possibility that other agents in fungal propagules also cause adverse health effects. During my 2002 NIOSH ERC pilot project, I discovered that the fungal fragments are released together with spores from contaminated surfaces in large quantities and contain immunologically active components. The aim of this study was to characterize the size distribution of released fungal propagules.

Fungal cultures of *Aspergillus versicolor* of three different ages (28~32-weeks old (old); 8~9-weeks old (mid-aged); 4~5-weeks old (young)) were used as the fungal sources. Fungal propagules were released into the air by Fungal Spore Source Strength Tester (FSSST), fractionated according to their aerodynamic sizes and measured using an Electrical Low-Pressure Impactor (ELPI). A bimodal size distribution of airborne fungal propagules was observed for all three different aged fungal cultures. One mode was in the size range of 1.26-1.99 μm representing intact spores, and the other was in the range of 0.07-0.31 μm representing fragments. The release of fungal fragments was found to vary depending on the age of the fungal culture. The concentration ratio of fragments to spores for old culture was found to be 1.4 times higher than that for the young and mid-aged culture. The age of fungal culture also affected the size distribution of fungal spores showing a mean spore size of 1.84 μm for the mid-aged culture, 1.68 μm for the young culture, and 1.55 μm for the old culture. The mean size of fungal fragments was 0.25 – 0.26 μm and was not different for the cultures of three different age.

**Respiratory Protection Against Viruses: The Protection Provided by Respirators Against SARS-causing Corona Virus Simulated
by Non-biological Particles**

**Shu-An Lee, Doctoral Student and Tiina Reponen, Ph.D., Associate Professor**
**Department of Environmental Health – University of Cincinnati**

Recently, viruses have. caught worldwide concern because the outbreaks of SARS (Severe Acute Respiratory Syndrome) prevail in Asian area such as Hong Kong, China, Singapore, Taiwan, and Vietnam. Some studies have shown that Corona virus may be a possible cause of SARS since it has been found from patient's body fluids or respiratory secretions such as feces, saliva, and sneezing and coughing droplets from nose and mouth. In order to prevent people from SARS infection through air transmission, two types of respirators have been recommended by CDC and World Health Organization (WHO) against SARS. N95 Respirators are recommended by (WHO) to protect against SARS. Surgical masks are recommended by CDC for flight crews and passengers in the airplane. Based on NIOSH new certification regulations for respirators (42 CFR Part 84), all respirators satisfy the 1994 CDC guidelines and are classified into nine new categories. The number " 95 " in this designation means that the filtration efficiency of the respirator is at least 95 % at the most penetrating particle size range from 0.1 to 0.3. So far, we know that the viral size range is ranged from 0.02 to 0.3 pm. Regarding the filtration efficiency of N95 respirators, there are few studies available for the protection offered by respirators in the viral size range. Moreover, CDC test is performed with a respirator, which is well sealed to human face. The face seal leakage is not taken into account. Therefore, in this study, we are going to investigate both filtration efficiency and overall protection, which takes the face seal leakage into account. One manikin and five human subjects will be equipped with our newly-developed personal setup, which is originally designed for collecting the fungal spores and dust inside and outside the respirators in agricultural environments. This setup will be modified to fit to perform pilot experiments using non-biological particles of viral size range. This data will provide very important pilot data for the protection of respirators against SARS-causing virus. Also, these data will be published as a peer-review article and will be used for preparation to apply for a large grant from NIOSH/NIH.

**Psychosocial Factors and Musculoskeletal Symptoms (MSS)**
**Among Construction Workers**

**Sam Salem, PhD, Assistant Professor,**
**Civil and Environmental Engineering – University of Cincinnati,**

This Pilot Study will examine the associations between psychosocial stressors such as job dissatisfaction. intensified workload, monotonous work, limited job control, role ambiguity, and limited social Support from supervisors and co-workers with Musculoskeletal Symptoms (MSS) among construction workers. Two construction trades are included in this study: Masonry Workers and General Laborers. The study will provide initial estimates of validity and reliability of a proposed data analysis instrument in the form of a questionnaire. Physical work-related factors will be analyzed and the interaction between the psychosocial stressors and these factors will be assessed, controlling for other important confounding variables. Additionally. workers will be directly observed on the job to characterize the physical exposures.

**Impact of Realistic Sudden Loading on Back Biomechanics**

**Susan E. Kotowski, Doctoral Student and Kermit G. Davis, PhD, Assistant Professor,**
**Department of Environmental Health – University of Cincinnati**

Occupations that require sudden maximal physical efforts in response to unexpected loading have a particularly high incidence of low back injuries. It has been shown that single sudden loading conditions produce greater peak muscle forces, as well as changes in other variables that are dramatically inflated compared to those for expected loading conditions. However, little research has been conducted on how repeated sudden loading situations affect the biomechanical response. Also, most of the previous sudden loading research has evaluated unrealistic lifting conditions. It is hypothesized that realistic repeated sudden loading situations would cause a change in back biomechanics. The specific aims of the proposed study will be to 1) quantify the impact of realistic repeated sudden loading in a single instance as well as over a series of repeated sudden loading situations, and 2) since repeated sudden loading has the potential to impact the lifter's approach to the subsequent lift, the proposed study will also investigate how subsequent lifts are affected. In the proposed study three sets of lifts will be investigated: completely randomized weights unknown to the lifter, completely randomized weights known to the lifter, and sequential lifts of weights known to the lifter (e.g. sets of 15 lifts with same weight). Split-plot analysis of variance (ANOVA) will be used to identify whether significant effects (due to unexpected sudden loading condition, both independently as well as interactively with weight) exist for muscle activities, trunk kinetics, trunk kinematics, and spinal loads. It is expected that the current study design will provide innovative information of the complex relationship between lifting of known and unknown box weights (essentially sudden loading situations). The data from the current proposed study will serve as a foundation for a larger and expanded laboratory study that would include more intensive evaluation of the effects of sudden loading as well as looking at both experienced and inexperienced personnel in manual materials handling. Future work will investigate the inter-relationship between postural stability issues (e.g. loss of balance) and the low back biomechanics that are in response to realistic sudden loading.

**A Study of Musculoskeletal Disorders and the Existence and Impact of Cultural Differences on Software Product Development**

**Tushyati Maudgalya, Graduate Student, Ash Genaidy, PhD, Associate Professor**
**Department of Mechanical, Industrial and Nuclear Engineering – University of Cincinnati**

My research study focuses on attempting to determine if cultural differences have an impact on outsourcing (*see formerly submitted proposal document*). In an attempt to understand this impact from the point of view of software outsourcing and establishing offshore development centers (ODCs); the study is divided into three sections:

1. A study of musculo-skeletal disorders and stress symptoms among software developers based in the Indian office and comparing them to the results of the same study performed on their North American counterparts.
2. Using the D-E (Demand Energizer) model to evaluate the work compatibility of the software developers in India and comparing it to the work compatibility of the software developers based in North America.

Analyzing work/communication/management preferences for the software developers based in India and comparing it to the preferences stated by the software developers in the North American office.

**Evaluating the Return-to-Work Utility of FCEs**

**Trang Nguyen, M.D., Kermit G. Davis Ph.D., Occupational Safety and Ergonomics, University of Cincinnati**

The economic impacts of occupational injuries have become phenomenal. With such a large impact on society, there is a necessity to get the injured individual back to being a productive and pain-free worker as well as ensure no recurrence of the injury. As a part of the return-to-work process, healthcare providers are utilizing Functional Capacity Evaluations (FCE) to quantify the capabilities of the workers. A recent literature review in the spring of 2002 indicated that most of the present commercial FCE system has little or no validity established. This pilot study will evaluate the short-term utility (predictive validity) of the Osborne FCE protocol. It is hypothesized that a more accurate assessment of an individual's functional ability can be achieved by utilizing medical and social historic factors, physical exam by a physician, and testing of functional capabilities utilizing physiologic parameters along with selective psychometric testing. Furthermore, the overall effectiveness of the FCE will also depend upon the matching of the workplace requirements.

This pilot study will evaluate twenty-four individuals who recently injured their lower backs and are being assessed for their capability to return-to-work. The pilot study will begin to understand the role of physical demand on the job relative to the FCE assessment from the Osborne FCE protocol. The participants will be followed for one month to determine whether loss or restricted days were accumulated as well as the current discomfort in the lower back. The data from this pilot study will be used to develop a larger, more comprehensive FCE protocol that will integrate medical history, physical exam, medical records review, objective findings from different tools such as Lumbar Motion Monitor, Jamar, Hanoun FCE system, psychometric testing, and ergonomic assessment of the workplace to formulate a protocol to appropriately return individuals to work.