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First Annual

Pilot Research Project Symposium

Abstract Booklet
1999 and 2000 Awardees

October 12 & 13, 2000
Kehoe Auditorium
Kettering Laboratory

- **Thursday 10/12/00 2:00—5:00 p.m.**
- **Friday 10/13/00 8:30—11:30 a.m.**

Department of Environmental Health
University of Cincinnati
222 Kettering Laboratory
PO Box 670056
Cincinnati, OH 45267-0056
513-558-5710
Karen.Brackemyre@uc.edu

Abstracts

Presentation Schedule
October 12, 2000 2:00 p.m. — 5:00 p.m.

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2:34 - 2:53	Reed, Deborah (1999/UK)	Occupational Health Issues of Female Long Haul Truck Drivers
2:53 - 3:12	Kelly, Cynthia (1999/UC)	Psychometric Instrument Development: Using Rasch Rating Scale Method to Develop a Cognitive Measure for Cardiovascular Health
3:12 - 3:19	Gazo, Rado (2000/PU)	Ergonomic Solutions for the Wood Industry
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9:01 - 9:08	Inumaru, Chie (2000/PU)	The Efficacy of Natural Products as Antifungal Agents in Building Materials
9:08 - 9:27	Lu, Ming-Lun (1999/UC)	Assessment of Risk Factors Associated with Work on Slippery Surfaces at an Automobile Parts Manufacturing Facility
9:27 - 9:34	Rhodes, Audry (2000/UC)	The Effects of JP-8 Jet Fuel on the Immune System of Tank Entry Workers
9:34 - 9:53	Rao, Preethi (1999/UC)	Residual Pesticides in Soil/Dust Samples from the Homes of Farm Workers in Gujarat, India: Observation of Worker Practices, Preliminary Assessment of Pesticide Levels in Home Soil/Dust and Methods of Analysis for Future Monitoring
9:53 - 10:00	Rush, Michael (2000/WKU)	A Study of Occupational Injuries of EMS Workers in Kentucky
10:00 - 10:07	Rao, Preethi (2000/UC)	Evaluation of Feasibility of the Use of a Uniform Pesticide Poisoning Reporting Form for an Agricultural Area in Gujarat, India and Deter mination of the Changes in Pesticide Levels in Soil/Dust Samples, Before, During and After Use of Pesticides, in the Homes of Farm-workers in the Agricultural Area
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10:49 - 11:08	Jones, Susan (1999/UC)	Assessing Factors Contributing to the Use of Respiratory Protection of Workers in Swine Confinement Buildings
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Genetic Counseling for Occupational Hazards: A Pilot Study

Ginger Eileen Hepler, M.S. student, Genetic Counseling — University of Cincinnati

Each year an estimated 20 million workers in the US are exposed to occupational hazards; 4% of cancer-related deaths are linked to occupational exposure. Individuals in the workplace are not the only family members at risk; if a spouse or parent carries home toxic residue on their clothing, skin, or vehicle. Workplace hazards include chemicals, noise, heat, and vibration. These hazards can result in infertility, miscarriages, birth defects, and cancer in exposed individuals or their offspring. Genetic counselors (GCs) commonly counsel individuals having such outcomes. This study assessed if GCs collect occupational histories and how this information is used in risk assessment and counseling. A questionnaire was mailed to 299 randomly chosen GCs. 213 (71.2%) responded to the anonymous survey; however, only 167 (55.9%) questionnaires were used in analysis. Respondents represented a cross section of genetic counseling practice. Overall, 47% indicated they always ask about client's current occupation, while 34% rarely or never do. Respondents sometimes or never ask about current occupation of client's partner (48.5%), previous occupations of client (91.6%) or client's partner (94.6%). Although 56.4% ask about exposure to chemicals when exploring occupational roles, less than 11 % ask about other types of workplace hazards such as noise, stress, or physical exertion. If a possible occupational risk is identified, 83% report always documenting this information and 49.7% report always discussing the exposure. 71.9% report being asked about occupational hazards at least several times a year. Most use Reprotox (76%), Medline (74.3%), and Brigg's, *Drugs in Pregnancy and Lactation* (67.7%) to research exposures. While 65°/o did feel adequately trained to identify potential risks to a fetus, 65% felt they were not adequately trained to identify occupational risks. 65.9% of respondents think GCs should be trained to address occupational risks with their clients, and 93.4% indicated they would like to learn more about occupational hazards through a website or short-course, or book. Education in this area is warranted as research in gene-environment interactions may foster future counseling demands regarding genetic susceptibility to environmental influences.

Assessment of Dust, Endotoxin, and Fungal Exposures in a Horse Containment Room

Michael Hunt, MS student, Industrial Hygiene — Purdue University

In order to assess airborne exposure to dust and endotoxin during the maintenance of a horse on three management systems (straw bedding + moldy hay (SM), straw bedding + pelleted feed (SP), and woodchip bedding + pelleted feed (WP)), levels of airborne dust and endotoxin (total and respirable) were measured within two horse confinement rooms. Additional study goals were to (1) validate a real-time aerosol monitor for sampling in the horse confinement room, (2) study the relationship between bulk endotoxin levels in the feed and airborne endotoxin, (3) qualitatively assess fungal exposures. Airborne dust levels were highest in the straw + moldy hay system moldy hay shaking samples (SM > SP > WP) ($P < 0.05$). Airborne endotoxin levels were highest in the straw + pelleted feed system (SP > WP > SM2) ($P < 0.05$ -room B). Airborne endotoxin levels within the SP and WP systems were much higher in room B than room A. This appeared to be related to pellet endotoxin levels, which were much higher in room B than room A. Strong correlations were found between bulk feed and total airborne area endotoxin ($P = 0.024$, $R = 0.73$). The DUSTTRAK was found to be highly correlated with total dust (all data: $P = 5.5E\text{-}11$), and weakly correlated with respirable dust (all data: $P = 0.062$). Aspergillus flavus, an opportunistic pathogen associated with allergic bronchopulmonary aspergillosis was found in the straw + moldy hay system.

Assessing Factors Contributing to the Use of Respiratory Protection of Workers in Swine Confinement Buildings

M. Susan Jones, Ph.D. student, College of Nursing — University of Cincinnati

The purpose of this research study was to: (1) define the content domain of the knowledge, attitudes and practices of workers toward the use of respiratory protection within swine confinement buildings; (2) design an initial measurement instrument with items for each subscale; (3) establish initial content validity of the items developed from the content domain and (4) increase the research capacity of the research trainee in instrument development and occupational health and safety research. The study used both qualitative and quantitative research methods. First, qualitative data were collected from two groups of workers using focus group interviews in two geographic regions of Kentucky. Pre-established questions were used to guide the interview. These questions were designed to encourage the workers to describe their work in swine production, the association of their work to their respiratory health status and their use of respiratory protection at the worksite. Both groups represented a convenience sample of workers in swine confinement buildings, but the groups were different. Group I, located in central Kentucky, was composed of 10 independent swine farmers whereas Group II, located in south central Kentucky, was composed of 13 individuals engaged in an employee/employer or contract grower/owner relationship. The length of time the workers had worked in swine confinement buildings ranged from eight months to 40 years. The interviews were audio recorded, transcribed and examined for common themes and concepts. A survey composed of statements summarizing these common themes and concepts was formulated and mailed to each individual participating in the interviews with a request that they review the statements, judge if each statement reflected what they believed had been shared during the interview and return the survey. The return rate was 100 percent (N=10) and 92 per cent (N=12) for Group I and Group II, respectively. Financial incentives were given to each participant for participating in the interview and for returning the survey.

All of the participants in Group I agreed with nine of the ten statements while nine (90 percent) agreed with the remaining statement. Seventy-five to 100 percent of the participants in Group 11 agreed with seven of the nine statements. There was strong disagreement with two of the nine statements. Results address the content domain of the knowledge, attitudes and practices of workers toward the use of respiratory protection in swine confinement buildings. The data indicate a general lack of knowledge regarding the health risks associated with working in swine confinement buildings. Dust exposure was generally accepted as an occupational risk associated with the work environment. There was an apparent lack of knowledge about the need for respiratory protection and the criteria for appropriate respirator selection. The perception of the workers is that the need for a respirator is greater when working with grain and tobacco dust that when exposed to dust in swine confinement buildings and that specific tasks (i.e. moving and loading pigs) increases the need for respirator use. Improved ventilation in swine confinement buildings along with the implementation of specific strategies (use of fat in ration, sprinklers and frequent washings) were believed to decrease dust exposure and thus the need for respirators. The behavior of the workers in regard to wearing respiratory protection at the worksite was not consistent among workers. The fact that some participants chose to wear respirators to prevent respiratory symptoms indicates an awareness of the workers of the need for using a barrier between the respiratory system and the work environment. Comfort was identified by the participants in Group I as the most important factor influencing the use of respirators. Fogging glasses was one of the main reasons curtailing respirator use. Easy accessibility and reminders to wear the respirators were other factors noted to increase respirator use. A limitation of the study may have been the presence of the employer in focus Group II. His presence prohibited open discussion among the workers. This study allowed the researcher to identify the preliminary content domain as described by the workers themselves, to establish initial content validity of this information and to increase the research capacity of the student.

Psychometric Instrument Development: Using Rasch Rating Scale Method to Develop a Cognitive Measure for Cardiovascular Health

Cynthia Weeks Kelly, Ph.D. student, College of Nursing — University of Cincinnati

Effectiveness of health promotional programs in the occupational setting must be demonstrated. In order to demonstrate effectiveness, outcome measurement tools that measure change in health behaviors need to be constructed. The Cardiovascular Health Instrument (CVHI) was developed to quantify health beliefs of employees with multiple high risk behaviors. The Cardiovascular Health Rating Scale (CVHI) is based on Prochaska and Diclementi's Transtheoritical Model (Stages of Change). This article discusses new approaches to rating scale development and provides evidence for construct validity of the CVHI using Rasch methodology.

Key words: Cardiovascular Health, Health Behavior, Rasch methods, Transtheoretical Model of Behavior Change & Health Behavior Rating Scale

Injury Trends for Adolescents with Perinatal and Early Childhood Lead Exposure

Laurel Kincl, PhD student, Occupational Safety and Ergonomics, Environmental Health — University of Cincinnati

The purpose of this study was to investigate adolescents with a known childhood lead burden to determine if they are at an increased risk of injury. The specific aims of this study were to obtain work and injury histories (since age 14) of the Cincinnati Lead Study cohort. Questionnaires were mailed to the cohort which were self-administered and returned to the principal investigator with a response rate of 42%. Both parametric and nonparametric statistical analyses were conducted. The descriptive information on work history showed 43% of the study group had a job at the time the questionnaire was administered and 58% had had at least one job in the past. Most subjects reported working in industries and occupations that were expected given the age (14-19 years) such as service (30%) and retail (25%) type jobs and 49% received some type of training on the job. The descriptive information on the injuries indicated that sprains (32%) and cuts (22%) were the most common type of injury, most happened at home (61%) and the upper extremities (50%) were the most common body part injured. Student's t-test and correlation analyses were completed to determine statistical noteworthiness ($p<0.15$, two tailed test) of blood lead concentration variables (prenatal, neonatal, mean for each year from 1-6, and mean lifetime blood lead concentrations) and potential covariates (measures of perinatal health, quality of early rearing environment, socio-economic status, adolescent drinking and drug history, personality and social deviancy, and intelligence) with the categorical variables of injured, limited activity, missed school, missed work, medical care received, and fall and the continuous variable of number of injuries (transformed to its natural logarithm). The variables found to be noteworthy were included in logistic regression or general linear regression models as appropriate which were tested for statistical significance ($p<0.05$, one-tailed test). The results demonstrated that elevated mean lifetime blood lead concentrations were significantly related to the being injured, an increasing number of injuries, the injuries causing limited activity and medical care, and the event or activity leading to the injury being a fall or loss of balance. An elevated maternal prenatal blood lead concentration was also associated with limited activity and falls and an elevated neonatal blood lead concentration with the limited activity. Gestational age was related to the injured variable and the quality of early home stimulation was related to the limited activity. Further study into blood concentrations and incidence of injury is necessary to fully understand the occupational safety and public health implications.

Evaluation of the Positional Effects of the Leg on *In Vivo* X-Ray Fluorescence Measurements of Stable Lead in the Tibia

Jeffrey Lodwick, Ph.D. student, Environmental & Industrial Hygiene — University of Cincinnati

A new position device for holding the UC Leg Phantom was made. The phantom itself was modified so that a fibula bone phantom could be inserted into it. In addition, a fibula bone phantom insert was fabricated and several sets of leaded bone phantoms with lead concentrations ranging from 0 to 102.3 ppm Pb were produced. Several assumptions integral to bone lead X-ray Fluorescence (XRF) measurements made at the tibia mid-shaft were tested using the new positioning device and phantom. The primary assumption that was tested is that normalization of the lead x-ray counts to the counts resulting from elastic scatter of Cd-109 photons with bone mineral self corrects the measurement for variation in rotational position of the leg and source-to-leg distance. Also tested was the assumption any interferences caused by the fibula are negligible. Although the normalization of the lead x-ray peak counts does appear to correct for changes in the rotational positioning of the leg some bias may be introduced in XRF measurements when source-to-leg distance is not held constant. Although the fibula may increase the number of x-ray peak counts the normalization to the elastic peak appears to correct for any small interferences that may be caused by the fibula.

Assessment of Risk Factors Associated with Work on Slippery Surfaces at an Automobile Parts Manufacturing Facility

Ming-Lun Lu and Laurel Kincl, Ph.D. students, Occupational Safety and Ergonomics, Environmental Health — University of Cincinnati

This study was conducted in an automobile parts manufacturing facility located in Ohio. The purpose of the study was to investigate the risk factors associated with work on slippery surfaces. Objective measurements of coefficient of friction (COF) and illuminance and various subjective measurements were taken in the production lines (A to G) of the facility. A hand-held slip meter was used for measuring the relative COF of the work surfaces. Questionnaires were self administered by the associates of the facility and used to obtain body discomfort, overall physical exertion, self-reported slip/fall incidences, overall perceived sense of slips/falls and subjective rating of slipperiness while performing various job tasks. The reportable injury records from the facility showed that the injury rate related to slips/falls decreased from 5 % (January 1998 to December 1999) to 2.4 % (January to July, 2000). Results from the study showed that lighting was sufficient for the job tasks being performed in the production lines except production line F (mean=18.28±2.43 foot candles). The production lines D, E and G had acceptable COF mean values that were greater than 0.5. However, the large standard deviations (SD) of the COF data (SD for D, E, and G were 0.06, 0.15 and 0.17, respectively) implied that the associates in the production lines E and G might experience unexpected slips/falls. The associates in production lines A, B and C that had COF mean values below 0.5 had a higher slips/falls risk potential than those in other production lines. Although the COF measurement in the study did not represent the COF between the shoes and the work surfaces, it gave the researchers "relative" potential risks for slipping on the various work surfaces. Future studies should test the COF between the shoes and the work surface. Four types of mats were commonly used in the facility. The use of mats in the facility did not appear to provide enough slip-resistance (i.e. low COF mean values) for the associates who worked on the slippery surfaces. It should be noted that regardless of the types of the mats used in the facility, the low surface COF mean values on mats may be caused by saturation of the machine fluids. The duration of use of the mats should be studied and determined so that appropriate clean-up or replacement procedures can be implemented. The shoe age was found to be significantly but negatively correlated to self-reported slip/fall incidences ($r = -0.25$, $p<0.04$). This indicated that the shorter the shoes were worn by the associate, the more slip/fall incidences were self-reported. The correlation implied that shoes with good traction (i.e. shoe age was lower) did not provide sufficient protection against slip/fall hazards. Future studies should investigate the effects of the shoes with different slip-resistance properties on slip/fall incidences. The shoe age was also found to be significantly correlated with the COF measurement ($r = 0.41$, $p<0.009$). It indicated that the lower the COF value was, the shorter amount of time the shoes were reported worn. Effects of the COF measurement and illuminance were not found to be significant on the subjective measures. Among the significant inter correlations between the subjective measures, the overall perceived sense of slips/falls and the rating of work surface slipperiness were found to be significantly correlated with self reported slip/fall incidences ($r=0.52$, $p<0.0001$ and $r = -0.39$, $p<0.0001$). This indicates that the overall perceived sense of slips/falls and the rating of work surface slipperiness can be used as good subjective measures for predicting slip/fall incidences in the workplace.

Residual Pesticides in Soil /Dust Samples from the Homes of Farm Workers in Gujarat, India: Observation of Work Practices, Preliminary Assessment of Pesticide Levels in Home Soil /Dust and Methods of Analysis for Future Monitoring

Preethi Lakshmi Rao, Ph.D. student, Environmental & Industrial Hygiene — University of Cincinnati

1. To evaluate potential exposure of farm workers to residual pesticides which maybe carried from the field into their homes (within the farms or away from them).
2. Become proficient in the Gas Chromatography / Mass Spectroscopy method for the analysis of 4 major OPP pesticides used in Gujarat i.e. malathion, methyl parathion, monocrotophos and phorate and the organochlorine pesticide DDT in the soil/ dust samples from the homes of farm workers and compare these results with the samples analyzed at Datachem Laboratories, Cincinnati.
3. Develop an observation checklist which will be pilot tested in Gujarat during the last 3 weeks of June, 2000.
4. Provide guidance concerning effective methods and equipment that can be set up at the B.V.M. College of Engineering laboratory for future quantitative exposure monitoring of pesticides in these villages.

Preliminary samples were analyzed at a commercial laboratory and arrangements were made with the Oregon Health Sciences Center Laboratory (OHSC), a laboratory with more sensitive methods, to assist with the analyses of a second set of samples that were collected from the homes of five poisoned workers. (Although several pesticides were detected in the preliminary samples, the detection limits of the methods used were not adequate to determine many of the pesticides.) During a visit to the OHSC Laboratory by the awardee the methods of sample preparation and analyses were demonstrated and initial preparation of the samples was initiated. During June, observations of work practices will be performed. During the course of the project several meetings were held with the Office of Pesticides of the USEPA and with NIOSH personnel involved in pesticide poisoning case reporting. A major gap in efforts needed to develop a poisoning intervention program is the lack of a reporting system to assess the effect of any intervention program.

Results of this project will be used in grant proposals being developed by faculty at the University of Cincinnati in collaboration with the Sardar Patel University and the Pramukhswami Medical School, both located in Gujarat, India. Results from this project were also used to develop another pilot project proposal to explore the applicability of the use of a poisoning reporting form developed by the World Health Organization for the uniform collection of such data world-wide and to collect/analyses samples from different times relative to the use of the pesticides. The investigator also learned the elements of a method capable of determining levels of pesticides in household samples. An R03 proposal is under consideration.

Occupational Health Issues of Female Long Haul Truck Drivers

Deborah B. Reed, Ph.D., Assistant Professor, nursing faculty — University of Kentucky

Objective: The long haul trucking industry is one of the fastest growing occupations for women in the United States, with females now comprising 6% of the driving force. The objectives of this study were to: (1) provide a description of the health status of female truck drivers; (2) identify social, economic and behavioral factors that influence access to health care; and (3) identify female truck drivers' health care usage patterns and barriers to obtaining health care.

Methods: A 32 item self-administered survey was designed and pretested with female truck drivers for face and content validity, cultural relevance, and reading comprehension. The revised survey was administered to 320 female long haul truck drivers in March, 2000. Women completed the survey completed in the presence of the research team.

Results: 284 complete and usable surveys were returned. Description of the final sample: median age 46, 95% white, 78% married, 53% with a high school education, 40% had at least some college education. Median household income was between $35,000 and $55,000. Median years experience driving 6 years, 227 days per year, average 9.4 hours per day driving. Over half indicated they always drive with a driving partner suggesting that sleep usually occurs in a sleeping berth while in transit. 56.7% indicated their health status as excellent or very good. Medically diagnosed health conditions included: sinus problems 27.8%, back pain 18.3%, migraines 17.3%, hypertension 15.5%, vision problems 12%, and depression 8.5%. While 40.7% were dissatisfied with health care on the road, only 7.8% were dissatisfied with health care when at home. Participants usually went to their family doctor for health care. If they became ill while driving, 46% waited until they returned home to seek care and 26% self-medicated with over the counter medications. 24% had no health insurance, 58.7% had no paid sick leave. Health information was most frequently sought from health providers and trucking magazines.

Implications for Nursing: Long haul truckers face many occupational health risks. Results from this study indicate that female truckers delay seeking health care when ill due to financial constraints and inadequate provision for health care while on the job. Nurses should consider ways to deliver health care at truck accessible places and during convenient hours. Health columns in trucker publications and truck web sites may also improve access to health information.

The Development, Assembly and Pilot Testing of a Task-Based Video Exposure Assessment System

John J. Vosicky, MS student, Industrial Hygiene — Purdue University

This project proposes to develop, assemble, and. pilot test a state-of-the-science hardware / software system that monitors vapors, gases, and particulates in "real-time" and allows the exposure data to be overlaid and synchronized with worker activities broken down into basic job elements on videotape. This technique allows for swift determination of the exposure sources allowing for a timely control method to be implemented..

The completed project will offer health and safety professionals a detailed summary of the advantages and disadvantages of using this video exposure assessment technology. The project will also provide health and safety professionals with a resource for the development, assembly, and use of a video exposure assessment system in his or her workplace. Therefore, the long-term goal for this project is to improve the exposure assessment capability of health and safety professionals in all industries.

A state-of-the-art video exposure system was developed and assembled to monitor personal exposure to methylene chloride and airborne particulates. This project involved the evaluation of an *intervention* procedure. The case study was conducted in an industrial facility in the Midwest where solute was added to a process tank of methylene chloride solvent. Six 45-minute runs were evaluated, three prior to the implementation of an engineering control and three after its implementation. Three different data analysis techniques were evaluated, each involved real-time exposure data linked with three different methods of obtaining worker activity information: (1) documentation of worker activity using notes taken during the charging operation; (2) video data of workers and (3) video data of worker activity using Multimedia Task Analysis (MTA) software to code worker activity and aid exposure trend analysis.

Development of Quantitative PCR to Measure Microorganisms in Metalworking Fluid Aerosols Implicated in Occupational Respiratory Illness

Jagjit S. Yadav, Ph.D., Assistant Professor, Environmental Health — University of Cincinnati

Pseudomonas species are predominant in metalworking fluids (MWF) and have been frequently implicated in respiratory disorders in occupational workers exposed to MWF aerosols. Therefore specific quantification of Pseudomonas in MWF is warranted for early detection and elimination of these occupational hazards. The conventional culture-based methods for quantification are largely based on plating using general or specific microbiological media which makes them time-consuming and ambiguous yielding only the viable (culturable) counts. In this pilot study, our objective was to develop DNA-based Polymerase Chain Reaction (PCR) methodology for quantitation of total microbial number (viable and non- viable) of *Pseudomonas* in MWF aerosols as an appropriate alternative to the conventional techniques in use. Major part of the work included the development of a competitive quantitative PCR using *Ps. fluorescens* as a reference strain. As a first step, extraction of DNA template from culture and aerosol suspensions of this organism was optimized. A competitor DNA (internal standard) designed to be 48 by shorter than the target 440 by DNA template but with the same overall sequence, was constructed using overlap extension strategy in PCR. Using Pseudomonas specific primers based on 16S ribosomal DNA sequence, amplification conditions were optimized and PCR product quantitation method was selected. A standard curve was prepared by amplifying increasing amounts of DNA extracted from serially diluted cell suspensions with a selected amount of internal standard (competitor DNA) and plotting the ratio of target to competitor signals (Y-axis) versus the cell number (X-axis). A known Pseudomonas cell suspension was used to derive the total cell number from the standard curve for validation of the developed technique and compared to the conventional plating technique. MWF aerosol sample obtained from the Aerosol laboratory of the department was quantitated for *Ps. fluorescens.* Results showed that the developed competitive quantitative PCR method gives relatively rapid and reliable measure of the bacterial cell number in metalworking fluid aerosols.

Work Related Musculoskeletal Disorders in Nursing Personnel: An Instrument Validation Study

Nancy M. Daraiseh, Ph.D. student Industrial Engineering and Mattie Burton, Ph.D. student Occupational Health Nursing — University of Cincinnati

There is increasing evidence that the domain of work requirements and work environment resources (e.g., physical & mental task demands, physical & non-physical work environmental conditions) can interact to create conditions which may result in adverse health effects including work-related musculoskeletal disorders (WRMD). The synergistic effects of multiple work factors on risk of WRMD have not yet been addressed. Hence, the long-term objective of this research trajectory is to investigate the synergistic effects of work factors on WRMD risk among nursing personnel, the highest occupational risk group in industry. The short term objective of this research is to establish the initial estimates of validity and reliability on two new instruments designed to assess work and worker factors contributing to WRMD.

Two classifications of nursing personnel will be administered the *Work Factor Analysis Instrument* and the *Worker Factor Analysis Instrument* on two separate occasions. Bio-physiological parameters will be collected on each participant to serve as external criteria in establishment of construct validity. Work tasks will be sampled over an eight hour shift for both classifications and will be used to examine content validity of the *Work Factor Analysis Instrument*. Results will be used to revise the instruments and methods for continued studies examining the interaction of work and worker factors and the contribution to WRMD.

Ergonomic Solutions for the Wood Industry

Rado Gazo, Ph.D., Assistant Professor, Department of Forestry & Natural Resources — Purdue University

The Indiana wood products industry ranks first in the United States in the production of wood office furniture, wood kitchen cabinets and several other products. In fact, the wood products industry is the sixth largest employer in Indiana and contributes over $2 billion in value added to the state's economy. This Indiana industry has maintained its productivity, quality of product, and health of its workforce more by hard work and American ingenuity, than advances in technology. The goal of this project is to bring advanced techniques to this industry to make it truly world class. This can be accomplished through a partnership between industry and academic researchers whose goal is to provide an innovative and integrated technology approach to advance Indiana's wood products industry. Specifically, Purdue's experienced interdisciplinary research team will establish, develop and implement an applied health and human productivity research program for Indiana's woodworking industry. This program will not only address the pending Ergonomics Standard by the Occupational Safety and Health Administration (OSHA), but it will also improve productivity.

The Efficacy of Natural Products as Antifungal Agents in Building Materials

Inumaru, Chie, Ph.D. student Industrial Hygiene — Purdue University

Indoor air pollution has become a chief concern among the many environmental threats to human health. Fungal growth in building materials is one of multiple factors involved in health problems reported for indoor environments. Water damaged building materials provide excellent growth media for molds, and as a result, spores or mycotoxins are released into the indoor environment. These mold spores or mycotoxins affect the building occupants in myriads of ways, causing medical problems and absences from work due to illness.

Antifungal agents can play a role in controlling fungal exposure if used as additives in building materials such as drywall, carpet, and ceiling tile. Because many chemically produced antifungal agents are toxic, it is important to consider the use of less toxic natural antifungal agents. Natural products are relatively safe and widely used as food additives and for medical and cosmetic purposes. If these natural products can be applied as antifungal additives in building materials, their control of fungal growth could reduce health hazards in indoor environments. There is no literature about the use of natural antifungal products being applied to building materials. The specific aims of this study are (1) to identify which natural products show antifungal activity and (2) to identify which natural products can be applied to building materials at different temperatures, moisture contents, and relative humidities (RH) to prevent fungal growth, and thus reduce indoor air quality problems and improve the public health.

Development of a New Method for Enumerating Airborne Microorganisms Sampled in Occupational Environments

Gediminas Mainelis, Ph.D. student, Environmental and Industrial Hygiene — University of Cincinnati

This research effort will be focused on developing a method for the dynamic counting of airborne microorganisms collected in a liquid for the purpose of microbial exposure assessment in occupational and residential environments. The method is based on the counting of stained microorganisms with a modified liquid optical particle counter. Liquid particle counters are designed for fast enumeration of solid particles suspended in liquids. My initial experiments indicate that light-scattering properties of bacteria suspended in water are different from those of solid particles and that they are not so "visible" in the counter. However, I expect that the counter will readily count bacteria and fungal spores after staining them with different microbiological dyes. My principal research hypothesis is that the new microorganism counting method will accurately enumerate microorganisms collected in a liquid, even in the presence of non-biological particles. The accuracy of the new method will be judged acceptable if it counts 80% or more of the microorganisms counted by traditional methods. The data will be accepted if the microorganism number count is found repeatable within 10%.

The specific aims for this research are:

1. Upgrade the available liquid particle counter and calibrate it with solid particles of known sizes and concentrations.
2. Enumerate unstained bacteria and fungi in water.
3. Enumerate unstained bacteria and fungi in a non-evaporating liquid.
4. Enumerate stained bacteria and fungi in water.
5. Enumerate microorganisms when both biological and non-biological particles are present in a liquid.

Investigation of Bioaerosols in and Around Swine Containment Operations

Shawn Gibbs, MS student, Civil & Environmental Engineering — University of Cincinnati

One of the main objectives of this research is to determine the potential impact of bioaerosols from swine-growing finishing operations on farm workers employed in and those adjacent to such facilities, and nearby residents, by identifying the levels and types of bacteria and fungi present in such bioaerosols. The potential pathogenicity of the bioaerosols will be thus assessed. The antibiotic resistance of bioaerosol bacterial isolates will also be determined, along with the sensitivities of the bacterial isolates recovered from agricultural fields injected (as a means of disposal) with swine manure and in nearby receiving bodies of water that drain the fields.

This study will be investigating the antibiotic sensitivities of the isolated bacteria, along with the presence of bacterial and fungal pathogens of human and animal significance. This study will also address bacterial and fungal microbes that may affect farmer and animal health, public health, and food safety concerns.

Evaluation of Feasibility of the Use of a Uniform Pesticide Poisoning Reporting Form for an Agricultural Area in Gujarat, India and Determination of the Changes in Pesticide Levels in Soil / Dust Samples, Before, During and After Use of Pesticides, in the Homes of Farm-workers in the Agricultural Area.

Preethi Lakshmi Rao, Ph.D. student, Environmental & Industrial Hygiene — University of Cincinnati

Specific aims:

1. Evaluate the potential use of the WHO (World Health Organization) form designed for the Harmonization of Collection of Pesticide Poisoning Data", for reporting pesticide poisoning cases from the district of Karamsad, in Gujarat, India.
2. Administer a modified version of the Agricultural Work Practice Questionnaire developed and used in a study conducted by Oregon Health Sciences University and the Center for Research in Occupational and Environmental Toxicology (OHSU/CROET) to obtain data on work practices and pesticide exposure.
3. Explore whether the data collected by the Poison Information Center at the National Institute of Occupational Health, in Gujarat can be used to complete the existing WHO form to help establish a uniform surveillance system in the this region of Gujarat.
4. To document the build up and die down of pesticides before, during and after spraying of pesticides through the analysis of soil/dust samples collected in and near the homes of farm workers.

Ultrafine Particulate Monitoring in Rubber Processing

Leslie Reed, Ph.D. student, Industrial Hygiene — Purdue University

The principal aim of the proposed project is to collect ultrafine particulate (UFP) air sampling data for an on-going study of air contaminant exposure levels in a rubber mixing and molding facility. The company manufactures small parts for the automotive industry. The characterization of exposure levels in the plant and the determination of safe exposure levels has been complicated by mixed chemical exposures in most job tasks. There is concern that this complicated mix of potential emissions is not being completely described and analyzed by traditional industrial hygiene methods.

The addition of the assessment of UFP will be investigated to determine if sources and particular segments of operations can be more easily characterized with real-time UFP measurements. The determination of real-time UFP exposure levels in this facility will add substantially to the existing data. It is hoped that this type of measurement may also aid in adjusting and improving controls to reduce worker exposures.

The Effects of JP-8 Jet Fuel on the Immune System of Tank Entry Workers

Audrey Rhodes, M.D., Occupational Medicine Resident — University of Cincinnati

Jet fuel is consumed worldwide at a rate of 60 billion gallons yearly. The U.S. Department of Defense annually uses 3.5 billion gallons, in the form of JP-8, with the Air Force as the largest consumer. Within the Air Force, tank entry personnel have the highest exposure to JP-8, especially when handling foam within aircraft tanks.

In mice, exposure to JP-8 altered the immune system by decreasing the number of lymphocytes in the spleen, thymus, lymph nodes and peripheral blood. Few studies have been conducted on humans to confirm these experimental findings and none have examined the subpopulations of T-cells responsible for cell-mediated immunity.

This cross-sectional study will examine the peripheral blood of tank entry workers and unexposed controls to determine if there are differences in the numbers of B-cells, T-cells, CD4 cells, CD8 cells and Natural Killer cells to gain some understanding of the effects of JP-8 on the immune system.

A Study of Occupational Injuries of EMS Workers in Kentucky

Michael K. Rush, Ed.D. student, Public Health Instructor,
Department of Public Health, — Western Kentucky University

This study will provide preliminary research data regarding (a) occupational diseases and injuries among Emergency Medical Services (EMS) personnel in Kentucky to facilitate improved working environments and safer working procedures for EMS personnel, and (b) evaluations of job attractiveness in situations involving varied emphasis on occupational disease and injury prevention by EMS employers.

OBJECTIVES:

1. Conduct a survey of EMS managers, paramedics, and emergency medical technicians working full-time in Kentucky EMS to determine differences in perceptions of EMS personnel at various levels (manager, paramedic, EMT) regarding on-the-job health and safety risks.
2. Compare reactions of various levels of EMS personnel to simulated job advertisements containing manipulations of job attributes including emphasis on occupational disease and injury prevention.
3. Conduct an analysis of existing data to develop descriptive statistics regarding incidence and trends of occupationally related illnesses and injuries in the Kentucky EMS workforce.
4. Establish a basis for evaluation of risk management and loss control programs aimed at preventing or reducing occupational injuries among EMS personnel.
5. Establish a basis for future research into occupational health and safety issues related to EMS professions.
6. Establish the Kentucky EMS survey as a pilot study for a future national study of occupational health and safety of EMS personnel.

Assessment of Workers' Exposure to Lead during Lead Abatement in Indoor Environments

Mikhaylo Trunov, visiting scholar and Ph.D. student, Environmental and Industrial Hygiene — University of Cincinnati

The primary objective of the proposed project is to assess workers' exposure to airborne leaded particles during lead abatement. This assessment will address specifically the inhalation pathway. The principal research hypothesis is that the concentration of inhalable aerosol particles released during lead abatement is significantly higher (00.05) as measured with the Button Personal Inhalable Aerosol Sampler than with the standard 37-mm closed-face filter cassette. Thus, the Button Sampler is hypothesized to be significantly better tool for personal inhalable aerosol exposure monitoring in lead abatement sites.

The specific aims of this research are:

1. To measure the concentration of airborne lead with the Button Personal Inhalable Aerosol Sampler and the standard 37-mm closed-face cassette while performing different lead abatement work tasks, such as dry scraping, dry sanding, wet scraping, and the cleaning cycle that includes the HEPA vacuuming and wet mopping of the floor.
2. To identify the work tasks that result in the aerosolization of "large" inhalable particles (in the size range of 20 to 100 gym). This identification will be performed through the particle microscopic analysis of filter samples collected during different work tasks.
3. To assess workers' exposure to airborne lead using the aerosol concentration data obtained with the Button Sampler and the 37-mm cassette. This assessment will be performed for each work task..
4. To identify the specific abatement tasks for which the utilization of the standard 37 mm cassette results in the underestimation of workers' lead exposure.

DNA Fingerprinting for Strain-specific Identification of Mycobacteria in Metalworking Fluids Implicated in Occupational Hypersensitive Pneumonitis

Jagjit S. Yadav, Ph.D., Assistant Professor, Department of Environmental Health — University of Cincinnati

Nontuberculous mycobacteria (NTM) in metalworking fluids (MWF) have recently been implicated as likely causal antigens in occupational respiratory illnesses. Our goal is to develop and apply DNA-fingerprinting approach for strain-level identification of mycobacteria in MWF for understanding the prevalent strains and their relevance to hypersensitivity pneumonitis (HP) in MWF exposed workers. The specific aims are (i). to optimize pulsed field gel electrophoresis (PFGE) as the DNA-fingerprinting technique using reference strain of NTM; (ii) to isolate NTM from metalworking fluids obtained from plants employing HP-diagnosed workers using mycobacterium-specific media; (iii). to apply the optimized DNA-fingerprinting technique for strain-specific identification of the NTM isolates from MWF samples. The resulting information will help NORA's objectives by providing practical methods for microbial exposure assessment and epidemiological investigations and facilitate development of intervention strategies related to MWF exposures.

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Other Participating Universities

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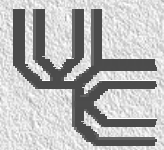

University of Cincinnati
Education and Research Center (ERC)
Supported by the National Institute for Occupational Safety and Health (NIOSH)
Department of Environmental Health
3223 Eden AV - PO Box 670056
222 Kettering Laboratory
Cincinnati, OH 45267-0056
Phone: 513-558-5710–Fax: 513-558-2722
Desktop Publishing by: Karen.Brackemyre@uc.edu