This environment posed more sampling issues than normal occupational workplaces due to the dynamics of the operation and the trauma associated with the attack. Sampling pumps were lost because of the team's inability to find the heavy equipment at the end of the sampling period. Asbestos samples overloaded due to the excessive risks associated with the safe retrieval of samples from equipment at the top of the smoking pile. Teaming with OSHA afforded the union team more complete information and greater individual safety for the sampling personnel. The partnership proved quite valuable to both parties.

340.

EVALUATION OF CONCURRENT PERSONAL MEASUREMENTS OF ACRYLONITRILE USING DIFFERENT SAMPLING TECHNIQUES. J. Zey, CMSU, Warrensburg, MO; P. Stewart, National Cancer Institute, Rockville, MD; R. Hornung, University of Cincinnati, Cincinnati, OH

In a retrospective assessment of employee exposure to acrylonitrile (AN) for an epidemiologic study, investigators from the National Cancer Institute (NCI) and the National Institute for Occupational Safety and Health (NIOSH) evaluated the feasibility of using historic acrylonitrile air samples. The evaluation was to determine whether air sampling results across plants were comparable. During site visits conducted between 1984-86, study investigators collected personal air samples for four days on approximately ten jobs per day. During these visits, company IHs at seven of the eight plants also collected personal samples in order to compare their sample values to the study-collected sample values. Plant IHs collected concurrent measurements for their own use, independent of the IHs at the other plants. Plant IHs had no common sampling protocol but employed professional judgment in deciding sampling logistics for their concurrent measurement. Additionally, each plant IH used a different laboratory to analyze samples (study IHs used one laboratory). Three sampling methods were used by plant IHs to collect concurrent measurements: charcoal tubes, passive monitors and porous polymer tubes. The study IHs used only charcoal tubes. A total of 264 pairs of concurrent measurements were collected. To assess the comparability of the data sets, paired-observation tests were used. The two sets of charcoal tubes were found to compare favorably with each other. The study's charcoal tubes were 1.2 times higher than results from plant passive monitors. No statistically significant correlation was found between the study's charcoal tube results and plant porous polymer tube results, although the means for 34 pairs of samples were equivalent. As a result of this evaluation, the investigators decided that no adjustments would be made to the plant measurements. Similar evaluations should be considered when using measurement data in multi-site epidemiologic studies.

341.

APPLICATION OF BERYLLIUM SURFACE SAMPLE DATA AS AN INDICATOR OF INITIAL HAZARD LEVEL AND NEED FOR CONTROLS. K. Karns, E. Andazola, C. Catlett, Los Alamos National Laboratory, Los Alamos, NM

It has been an accepted belief that surface samples are not indicators or predictors of potential inhalation exposures. Extensive surface sample data at Los Alamos National Laboratory (LANL) has been compared with follow-up air samples and a correlation between surface sample data and airborne sample data indicates that a less restrictive limit provides adequate protection from airborne resuspension hazards. This paper will explore the correlation and discuss the potential benefits of using surface sample data for preliminary hazard analysis and controls. The DOE has mandated a housekeeping limit of 0.2 ug/100cm2 for non-beryllium areas. Baseline sampling was conducted at LANL. The sampling method used involves the capture of unbound particulate from area surfaces. It is collected to assess and monitor the adequacy of housekeeping or contamination control efforts and to possibly identify unknown contamination sources. Through the baseline sampling effort, it was discovered that surface beryllium concentrations exceeded the limit in more areas than previously thought. To evaluate the airborne exposure risk and reassure the working population regarding work place safety, area air sampling was performed in these areas during normal work operations. Furthermore, personal air sampling was done during decontamination operations. Air sampling results were compared with surface sampling data. In conclusion, the comparison demonstrated that no airborne release occurred in areas where surface sampling data was less than 100 ug/100cm2. This data may have benefits in determining the hazard level of decontamination operations and selection of PPE for those operations. Certainly, the data evaluation should be compared with other facilities' data. Ultimately, data may indicate that the DOE housekeeping limit is very conservative in nature and that a cost/benefit analysis of raising the limit may be warranted.

342.

PRELIMINARY EVALUATION OF LEAD AND COMBUSTION PRODUCTS EXPOSURE AT ARMY SHOOT HOUSE. R. Rogers, U.S. Army CHPPM, Edgewood, MD

Military personnel train for operations in urban terrain using facilities designed for that purpose. One type of training involves small teams of soldiers operating in close quarters in specially designed facilities called shoot houses and towers. This training involves soldiers learning target discrimination techniques using live ammunition and pyrotechnics. While training in these facilities, the personnel are exposed to the combustion byproducts of the pyrotechnics and small arms ammunition that are used. A previous limited study had shown that personnel maybe exposed to lead and carbon monoxide above concentrations that may create an unacceptable health risk. This preliminary study was designed to evaluate the health risk to the soldier while training at shoot houses. In this study we looked at two designs, a multistory building (tower) and a two-story building. Natural ventilation was provided to each facility using different designs. Instructors and team members are potentially exposed. The instructors are exposed longer because they arrange scenarios inside the shoot house/tower and then instruct and monitor the teams of students as they breach and clear the structure. The study sampled both the instructors and the team members for lead, carbon monoxide, formaldehyde, nitrogen oxides, and total dust. The study indicated that there was a potential for exceeding the occupation exposure limit for lead. Exposures to carbon monoxide and other combustion products were low. Further studies to characterize the sources of the exposure and evaluate potential controls are planned.

343.

U.S. DEPARTMENT OF ENERGY SITE REMEDIATION WORKERS: ASSESSING THE AVAILABILITY OF WORKER, EXPOSURE, AND MEDICAL HISTORY INFORMATION. G. Kinnes, S. Silver, T. Taulbee, S. Ahrenholz, C. Robinson, NIOSH, Cincinnati, OH

Since 1989, the U.S. Department of Energy (DOE) mission has shifted from weapons production toward environmental restoration and remediation at 134 former and current sites. Remediation workers face diverse and sometimes unanticipated exposure hazards, both radiological and chemical, not previously encountered by production era workers. The National Institute for Occupational Safety and Health (NIOSH) recently conducted feasibility studies at seven of these sites to identify the remediation workforce and their activities and to examine the availability of exposure data.

DOE remediation workers are involved in defined activities including decontamination, decommissioning, deactivation, dismantlement, environmental restoration, and hazardous waste. These activities can involve exposure to one or more waste types such as low-level radioactive waste, low-level mixed waste, spent nuclear fuel, and transuranic waste which can involve over 50 different radioisotopes and a myriad of chemical agents. Remediation workers are not uniquely identified at most sites due to changes within the DOE and individual site management structure and organization from the production era to the present. The implementation of tiered subcontracting practices, which increased the number of on-site contractors, and the increasing use of general occupational job titles has made identifying and tracking remediation workers extremely difficult. Therefore, the number of workers involved in

remediation activities at the seven study sites could only be estimated (~10,000 in 1996). Radiologic exposure histories for these workers are reasonably comprehensive due to standardized monitoring practices. However, industrial hygiene, medical, and personnel data collection and reporting are not standardized and tend to be incomplete.

NIOSH identified that considerable changes are needed in the collection and maintenance of work, exposure, and medical history data. Examples include the development of a centralized remediation worker data base and standardized industrial hygiene data collection and reporting programs. Such changes will facilitate the conduct of future surveillance efforts and epidemiologic studies.

344.

QUALITATIVE EXPOSURE ASSESSMENTS IN THE ADJUDICATION OF WORKERS' COMPENSATION CLAIMS FOR OCCUPATIONAL DISEASES: ROLE OF OCCUPATIONAL HYGIENISTS.
D. Chung, C. St. Pierre, WSIB, Toronto, ON, Canada

Introduction: In 1999, the WSIB adjudicated approximately 100,000 lost-time claims. Only 4.4% of these claims were attributed to exposure to a harmful substance. However, the cost associated with these claims accounted for an estimated 20% of the total compensation cost. To adjudicate occupational disease claims 2 essential pieces of information are required, a medical diagnosis and the exposure profile for the worker. Prior to 2001 few occupational disease claims at the WSIB were adjudicated with the aid of dedicated occupational hygienists.

Scope of problem: To provide exposure profiles the Hygienist must reconstruct the conditions and possible exposures for work processes that were in operation years and sometimes decades in the past. These exposure assessments can encounter a myriad of challenges such as: lack of access to the worker, changes to the work environment, lack of historical processes information and credible sampling data and complex work histories. Often traditional exposure assessment techniques such as sampling are not possible. Therefore, a qualitative approach is often utilized.

Methods: Exposure assessments are conducted in manufacturing work sites to ascertain claimants' exposures to a variety of chemical substances present at these facilities. Tools used to conduct these assessments included: interview of retired co-workers and family, union seniority lists, historical SOP, regulatory inspection reports and process and exposure information from sources such as NIOSH, the EPA and OSHA. Risk maps are drawn to mark the locations in the workplaces where processes and potential hazards were found. All the information gathered is then summarized to obtain exposure risk rating for different substances by process, job, tasks, time period and work site factors. Exposures are rated for their potential/intensity, frequency, duration, and certainty. This information is then linked to the work history of the worker to obtain personal exposure estimates.

345.

USE OF SWALLOWABLE CORE BODY TEMPERATURE SENSORS AND OTHER MEASURES FOR A HEAT STRESS EVALUATION OF EMPLOYEES OF A SOUTHWESTERN U.S. PARK. A. Krake, NIOSH, Cincinnati, OH

Because of working conditions of high heat stress and moderate to extreme physical exertion, the potential for the development of heat stress prompted southwestern U.S. park managers to request NIOSH assistance. In response, NIOSH investigators evaluated heat stress and strain among park service personnel using swallowable core body temperature (CBT) sensors, external heart rate monitors, and WBGT monitors. Pre- and post-shift weight comparisons were made and changes in blood chemistries were determined. In addition, job activities were analyzed according to metabolic heat production estimates. ACGIH suggests a maximum CBT of 101.3°F for medically selected, acclimatized personnel and 100.4°F for unselected, unacclimatized personnel. For individuals with normal cardiac performance, sustained heart rate (over several minutes) should not exceed 180 beats per minute (bpm) minus age. Chronic demands placed on the body were evaluated by calculating the average heart rate for the entire activity, which should not exceed 115 bpm. Finally, there is a greater risk of heat strain if profuse sweating is sustained over hours, so weight loss over a shift should not exceed 1.5% of body weight. NIOSH work/rest regimen tables were used to plot the estimated metabolic heat against the environmental heat measurements. On all but two days (of eight), WBGT temperatures exceeded 90°F, with a high of 98.8°F. Dry bulb temperatures exceeded 109°F every day, with a high of 122.5°F. Physiological sampling results indicated that every study participant experienced heat strain to some degree. Most of the participants developed mild dehydration during their activities, but their electrolytes remained within normal limits. Body weight comparisons showed an average loss of 1.2% among participants. Metabolic heat production estimates showed most activities were close to or exceeded the parameters of the NIOSH work/rest regimen. Recommendations were made to develop heat stress management and illness surveillance systems.

Indoor Air Quality

Papers 346–350

346.

THE RELATIVE CONTRIBUTION OF THE HVAC SYSTEM TO THE TOTAL FIBER BURDEN IN INDOOR SPACES.
W. Thomann, J. Tulis, E. Chen, Duke University, Durham, NC

The HVAC system is frequently cited as a primary source of fibers in indoor spaces, particularly if the system has internal fiberglass insulation. On-going studies, using NIOSH Method 7400 A, are being conducted to provide quantitative data on the relative contribution of the ventilation system per se to the total fiber burden. The HVAC systems evaluated include both internally and externally insulated ductwork. The relative contribution of the HVAC system to the total fiber burden is determined by collecting samples at the supply air diffuser using a tent-like enclosure to shield the sample from the room environment. Concurrent samples of the room air are then compared to the supply diffuser information. Additional studies to assess potential emission or removal of fibers within the HVAC system have been conducted by collecting "isolated" samples at various sites within the air handling unit, namely, the outdoor air intake, the return air plenum, and the post-filtration area. These samples were collected using an engineered orifice that is sized for isokinetic sampling of the airstream. Microscopic analysis of the samples allows characterization between natural and synthetic vitreous fibers (SVF). The supply diffuser fiber counts in one study of laboratory buildings averaged 0.00036 fibers/cc in externally insulated systems and 0.00048 fibers/cc in internally insulated duct systems. The average count in a similar study of office buildings was 0.0107 fibers/cc in internally insulated duct systems (no externally insulated systems were evaluated). SVF were not detected in many of the samples in both studies and the average concentration of SVF was 0.00015 fibers/cc. These studies suggest both that SVF constitute a minor component of the total fiber count in occupied spaces and that the air distribution system is not a significant source of fiber emissions into the indoor environment.

347.

HVAC SYSTEM EVALUATION-AN INITIAL RESPONSE TO IAQ COMPLAINTS. V. Ivensky, T. May, Urban Engineers, Inc., Philadelphia, PA; B. Scott, K. Banks, City of Philadelphia, Philadelphia, PA

The evaluation of HVAC systems on the initial stages of an IAQ investigation and prompt correction of identified problems can quickly alleviate IAQ complaints and avoid costly and often inconclusive air sampling efforts. Typical HVAC problems may include design or construction flaws, history of poor maintenance with associated problems, lack of minimum outside air supply, improperly selected filters, improperly positioned thermostats, or building renovations with no regard to HVAC system design. Recent IAQ investigations conducted by the authors in large, multi-use public buildings identified several such concerns related to HVAC systems. Problems that caused the most widespread IAQ complaints were: inadequate return ventilation, entrapment of contaminated air by return and induction systems, incorrect

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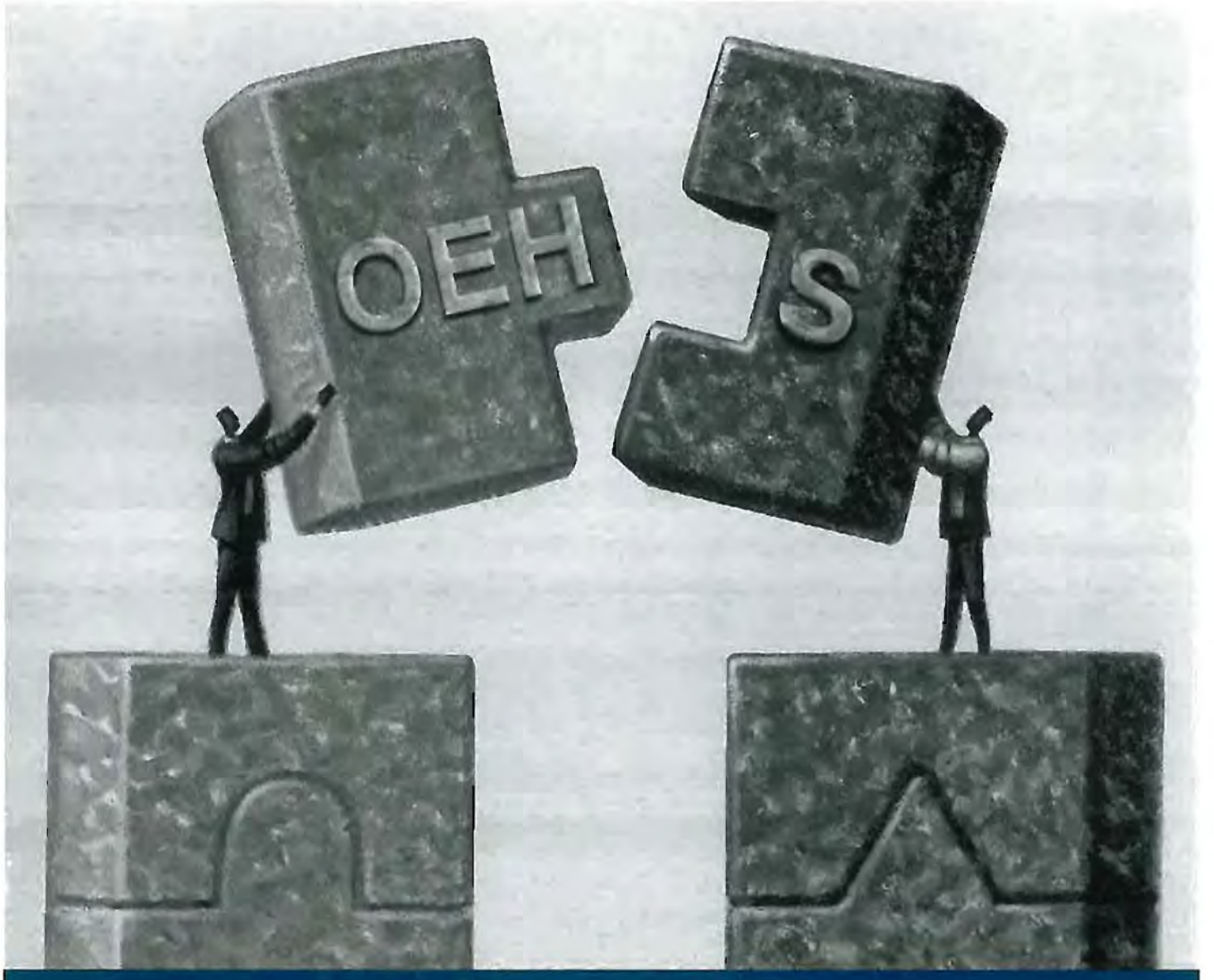

ABSTRACTS

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2002 Abstract Index by Session Topic

PF 101 Agricultural Health and Safety

Papers 1–6

1.

RELATIONSHIPS BETWEEN WORK EXPOSURE AND RESPIRATORY OUTCOMES IN POULTRY WORKERS.

S. Kirychuk, J. Dosman, P. Willson, L. Dwernychuk, University of Saskatchewan, Saskatoon, SK, Canada; J. Feddes, A. Senthilselvan, C. Ouellette, University of Alberta, Edmonton, AB, Canada

A pilot study was conducted on 74 poultry barn workers in Western Canada during the winters of 1998–2000. General respiratory health, current, chronic and work related respiratory symptoms; general work duties, and work-site factors were ascertained, pre-exposure, by questionnaire. Personal airborne exposure levels and changes in symptoms and lung function were measured across the work-shift for all workers. Workers were classified according to the type of poultry operation (floor based, n=53; cage based, n=13) in which they worked. There was no significant difference in daily hours spent in the barn between those who worked with caged poultry (5.41±2.35 hours) and those who worked with floor-based poultry (4.42±2.48 hours). Age of birds was 47.10±58.36 days for floor based versus 155.91±63.01 days for cage based facilities. There were no significant differences in personal environmental measurements between cage-based and floor-based facilities (ammonia 13.22±13.70 ppm, 17.34±16.35 ppm; total dust 5.74±4.85mg/m^3, 10.01 ±8.84 mg/m^3; endotoxin 6046±6089 EU/m^3, 5457±5934 EU/m^3 respectively). There were no significant differences in across work-shift change in pulmonary function indices between workers from cage and floor-based operations. For the entire sample total dust dose (work hours/day x total dust) significantly correlated with across-shift change in FEV_1, whereas endotoxin dose and ammonia dose did not. Stocking density was significantly correlated with average ammonia (ppm, p=0.002) and ammonia dose (ppm x work hours/day; p=0.004) in floor based operations and with total dust (particles/ml, p=0.002) in cage based populations. Stocking density was also significantly correlated with chronic cough (p=0.003) and across work-shift cough (p=0.05) and chest tightness (p=0.06) for workers from floor based operations; and with phlegm when working (p=0.018) and chest tightness across the work-shift (p=0.004) for workers from cage based operations. Type of poultry production operation and therefore type of work exposures appear to significantly impact symptoms experienced by workers exposed to these atmospheres.

2.

DUST GENERATION SYSTEM FOR AGRICULTURAL SOIL DUST.

K. Lee, R. Domingo-Neumann, R. Southard, UC Davis, Davis, CA

Agricultural workers are prone to exposure to mixed dust of inorganic and organic compounds. Diverse working conditions and operations in agriculture make direct measurements of the mixed dust exposure difficult. This study was conducted to develop a new dust generation system to determine possible exposure potency indicators of soil samples. The dust generator consists of a blower, a rotating chamber and a settling chamber. The rotating chamber has inner baffles to provide sufficient agitation of the samples while the chamber is rotating. A blower provides air into the rotating chamber, and the suspended dust is moved to the settling chamber through a perforated pipe. A small fan inside the settling chamber helps maintain suspension of the dust. Various size fractions of dust are sampled on filters suspended in the chamber via outlet ports and attached pumps. Air pressure is released through a filter plate mounted on the wall of the settling chamber. Various operating conditions were evaluated: air intake from blower, speed of rotation, soil mass and sampling time. To evaluate the characteristics of dust from the system, we collected dust samples from agricultural fields while the soil was prepared for