diffusive sampler and an active sampling method utilizing sampling tubes containing material equivalent to hopcalite. Field trials were conducted using an isocratic sampler designed to draw air from a field environment and convey it to test samplers in a way that ensured a uniform presentation of the field air to the different samplers under test.

Surface Sampling

Papers 380–384

380.

A STUDY OF SURFACE WIPE SAMPLING VARIABILITY AND APPLICATION. M. Pannell, Los Alamos National Laboratory, Los Alamos, NM

The potential for exposure to surface metals contamination has long presented a problem for industrial hygienists. Surface sampling may provide a means to assess the presence of surface contamination, but exposure estimation may not be viable. Air sampling may be used to determine actual employee exposure, but the ability to pre-estimate the risk is difficult. Although there is no occupational limit for surface contamination, the Department of Housing and Urban Development has recommended limits for surface lead contamination in residential housing following lead-based paint removal. Further complicating the issue is the lack of an acceptable means to correlate surface metals contamination and personal exposures. This study has identified four causes of surface wipe variability; they are: 1) surface texture, 2) type and volume of wetting agent used, 3) type of sampling material, and 4) the coefficient of variability among samplers. Individual variability may be due to differences in applied sampling pressure, the sample pattern, and the technique used to fold the sampling media. Three potential solutions to minimize the variability are also presented; they are: 1) use of a vacuum method for surface sampling, 2) utilization of a minimum coefficient of variability for sampling personnel, and 3) the standardization of sampling technique and materials. This study further presents a means to correlate surface sample results with airborne exposure potential.

381.

MODIFYING THE HVS3 DUST SAMPLER. B. Curwin, D. Booher, D. Watkins, NIOSH, Cincinnati, OH

The High Volume Small Surface Sampler (HVS3, CS-3, Inc.) collects representative samples of dust which can be analyzed for lead and pesticides. It has been used in recent pesticide exposure studies and was used this spring by NIOSH to collect house dust samples in a study of farm family exposure to pesticides and lead. The HVS3 is a modified vacuum cleaner with an attached cyclone. The flow rate and pressure drop at the nozzle can be adjusted so that sufficient air velocity is generated to lift dust particles into the air stream. Criticism of the HVS3 is that it is difficult to obtain the proper flow rate and pressure drop during sample collection. Another criticism of the HVS3 is that when used on bare floors, the air exhausted from the vacuum blows any dust on the floor away from the collection nozzle. In attempt to improve the HVS3 we designed a separate chassis to hold the cyclone and nozzle so that it is no longer attached to the vacuum. The cyclone is then connected to the vacuum with a 12-foot tube. This design eliminates one of the steps currently needed to operate the HVS3, allows for a more consistent pressure drop and flow rate, and prevents dust from being blown away from the sample area by the vacuum motor. The chassis was successfully used recently in a study of farm families' pesticide and lead exposure. Operators reported that the flow rate and pressure drop were more easily maintained and they perceived that dust collection from bare floors was improved (although this was not evaluated quantitatively). The disadvantages to the chassis include the extra pieces of equipment that must be carried and the requirement that the operator has to be on his hands and knees when operating the equipment.

382.

DEVELOPMENT OF A SURFACE CONTAMINATION SAMPLING METHOD FOR 1,6-HEXAMETHYLENE DIISOCYANATE. S. Thygerson, D. Stephenson, University of Utah, Salt Lake City, UT; R. Lawrence, U.S. DOL/OSHA Salt Lake City, UT

1,6-Hexamethylene diisocyanate (HDI) is a polymerizing agent used in the production of polyurethane coatings including varnishes, lacquers, and paints. Use of these polyurethane coatings in paint formulations accounts for a significant source of exposure to HDI. Occupational dermal exposure to HDI predominantly occurs from contact with contaminated surfaces. Therefore, occupational monitoring of HDI is important to the health of potentially exposed workers. An HDI monitoring program requires sampling and analytical procedures to identify the presence of HDI on surfaces. The objective of this study was to develop a surface sampling and anlytical method to provide a standardized and practical means of detecting the presence of HDI on surfaces. This method is to be used to identify the potential for dermal exposure and not the quantitative dose absorbed by the human body. This method was developed in conjuction with the Occupational Safety and Health Administration Salt Lake Technical Center (OSHA SLTC). The development followed and met the requirements established in the OSHA guidelines for the development of surface contamination sampling methods. It is concluded that this method is to be used by OSHA compliance officers to evaluate with compliance to the personal protective equipment (PPE) standard. The method may also be used by industrial hygienists to identify the presence of HDI in the workplace, evaluate the need for additional PPE, establish appropriate decontamination procedures, and assess work practices.

383.

FIELD EVALUATION OF A LIBS SAMPLER FOR DETERMINING SURFACE CONTAMINATION DUE TO BERYLLIUM. M. Hoover, M. McCawley, D. Yereb, S. Tinkle, NIOSH, Morgantown, WV; S. Beaton, P. French, ADA Technologies, Inc., Littleton, CO

A prototype multi-spectral, laser induced breakdown spectrometer (LIBS) was used to collect information on potential beryllium contamination of work surfaces and equipment. The LIBS instrument used an adjustable, high resolution spectrograph equipped with a photodiode array to collect 512 channels of emission spectra over the wavelength range from 300 nm to 326 nm. Approximately every four seconds a new spectrum was created, displayed to the operator on a small, built-in personal computer, and stored in memory. The wavelength for the beryllium peak was 313 nm. The spot size for the LIBS interrogation of the surface was approximately 0.3 mm in diameter. The surfaces of interest were first interrogated directly by the detection wand, and then wipe samples were taken of the surfaces and placed under the wand for analysis.

Known quantities of beryllium oxide powder or beryllium sulfate solutions were placed on mixed cellulose ester filters in the concentration range of 0.01 to 400 ug per filter. The concentrations were verified using NIOSH Method 7300. The LIBS was able to clearly identify the presence of beryllium in either form, even at a concentration as low as 0.01 ug on a 37 mm filter. The control limit recommended by the U.S. Department of Energy Chronic Beryllium Disease Prevention Program is 0.2 mg/100 cm2 for release of items or work surfaces to unrestricted use.

The instrument was used to verify beryllium contamination on surfaces of a variety of composition including counter tops, shelving, and floors, and painted, plastic, and metal equipment. Independent verification of contamination was obtained through NIOSH Method 7300. Use of the LIBS device was successful in guiding a thorough and cost-effective cleaning effort and in confirming the efficacy of the measures taken.

384.

THE UPPER LIMITS OF ACCURACY OF TWO COMMONLY USED ANALYTICAL METHODS AND DUST SAMPLE COLLECTION METHODS FOR LEAD IN DUST WIPES. S. Roda, P. Quinn, P. Succop, S. Clark, University of Cincinnati, Cincinnati, OH

Factors that can affect dust sampling results may include the physical variability of leaded dust in the environment, the total amount of dust in the collection area, the actual wipe material used and the collection efficiency of the wipe sampling method. The recent reduction in the lead standard to 40 µg/sq. ft. produces many concerns including the accuracy and sensitivity of the method of lead dust sam-

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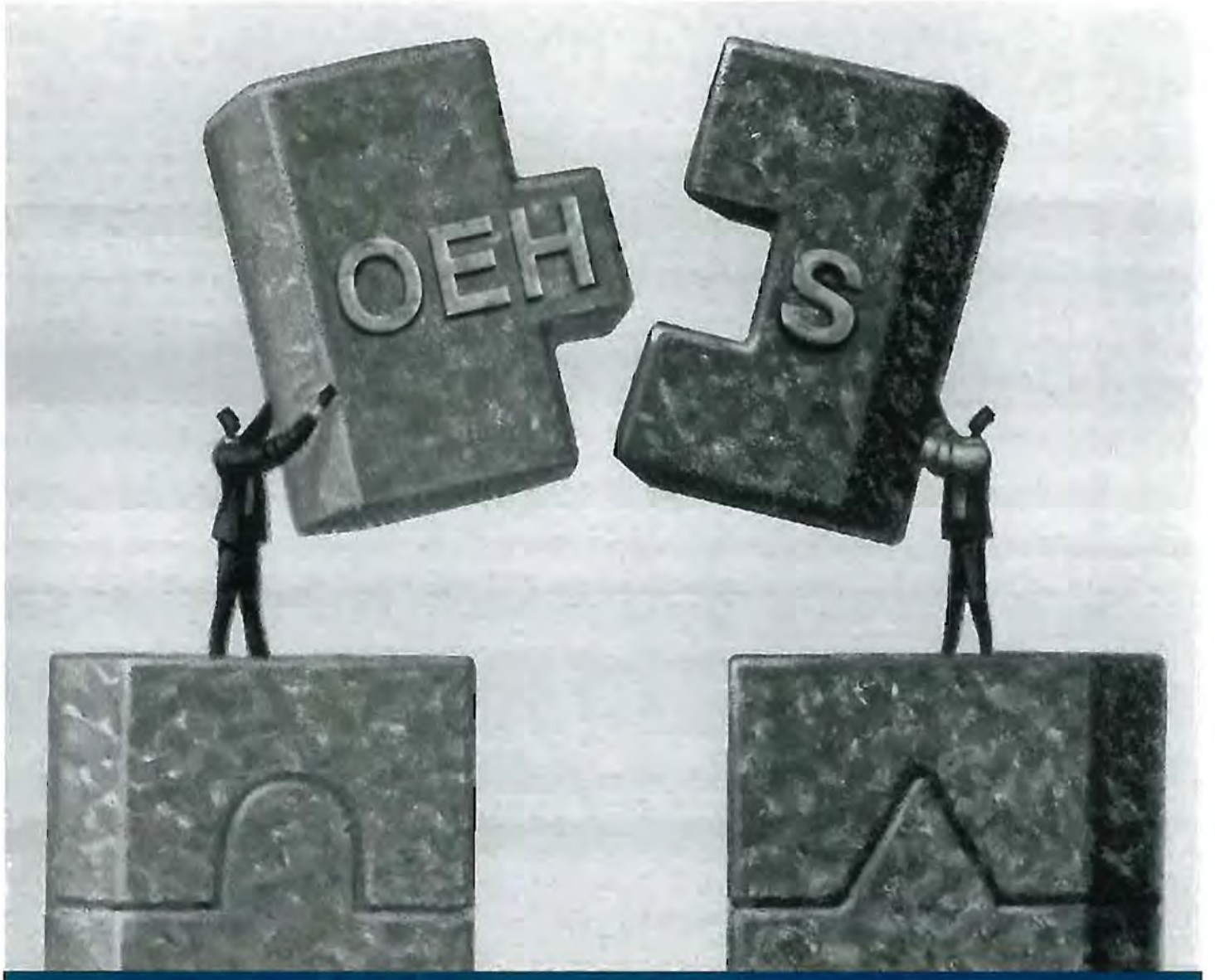

ABSTRACTS

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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