sample. The current HUD Guidelines suggest that composite wipe samples may be used for both clearance testing and risk assessment, while comparing the results to standards developed for individual dust-wipe samples. However, if the goal of clearance testing is to ensure that no single area within a residence is hazardous to occupants, clearance standards specifically designed for composite samples may be necessary to offer occupants similar degree of protection.

Battelle conducted a field study specifically designed to investigate the performance of composite dust wipe samples (in comparison to individual wipe samples) used for either risk assessment or clearance testing. In this study, the environmental sampling personnel from three field participants collected side-by-side duplicate dust wipe samples from multiple selected locations in approximately 250 residential units that required either risk assessment or clearance testing. The duplicate wipe samples were split; one was analyzed as an individual dust clearance sample, and the other was composited along with other wipe samples from the same component type. Visual inspection information was also integrated into the sampling protocol, in which inspectors guessed the dust-lead loading and commented on the "dirtiness" of the surfaces being tested. Results of the study demonstrated comparability of dust-lead loadings between the average of individual samples and their associated composite samples (p-value <0.01), and that visual inspection was predictive of dust-lead loading outcomes for all three residential surface types (p-value < 0.01).

106.

MEASUREMENT ERROR AND WITHIN-DWELLING VARIABILITY IN DUST LEAD SAMPLING. S. Dixon, J. Wilson, W. Galke, National Center for Healthy Housing, Columbia, MD

Measurement error and within-dwelling variability may significantly impact the interpretation of the results of dust wipe lead sampling of residential house dust, but the magnitude of their effects is not widely known. In this study, field measurements of lead-contaminated house dust from window sills, window troughs, and floors were collected in 4-6 rooms of each of 254 children's homes in Milwaukee, New York City and Baltimore County (sites) using dust wipe sampling. Variability was separated into between-dwelling variability and within-dwelling variability and the results were used to estimate error probabilities associated with concluding that a home in a site is above or below an applicable standard (40μg/ft^2 for floors and 250μg/ft^2 for window sills) based on the average of four samples. When the true average lead level was 20% *lower* than the standard, then the probability of *failing* the dwelling was less than 3% for floors and ranged from 11% to 20% for window sills. When the true average lead level was 20% *higher* than the standard, then the probability of *passing* the dwelling ranged from 4% to 10% for floors and 22% to 38% for window sills. Repeated (side-by-side) field measurements of lead-contaminated house dust from window sills, window troughs, bare floors and carpeted floors were collected in 155 of the 254 study homes. Measurement error and reliability ratio estimates for the different sites and sampling locations are presented. Reliability ratios for the three sites on window sills and window troughs ranged from 0.79 to 0.92. (The closer the reliability ratio is to one, the smaller the measurement error is relative to the underlying variability in the measurements.) Reliability ratios ranged from 0.68 to 0.88 on smooth floors and from 0.43 to 0.81 on carpeted floors.

107.

FIELD MEASUREMENT OF LEAD IN WORKPLACE AIR AND PAINT CHIP SAMPLES BY ULTRASONIC EXTRACTION AND PORTABLE ANODIC STRIPPING VOLTAMMETRY. K. Ashley, A. Sussell, NIOSH, Cincinnati, OH

On-site measurement of lead in workplace air filter and paint chip samples by ultrasonic extraction and anodic stripping voltammetry (UE/ASV) was evaluated in the field during renovation and remodeling activities. Field UE/ASV lead data were compared to UE/atomic absorption (AA) and hot plate digestion/AA results from fixed-site laboratory lead measurement. Determination of lead in air filter samples by UE/ASV was extremely well correlated with lead measurement by UE/AA and hot plate digestion/AA procedures. However, a significant negative bias due to ASV measurement was observed, and this was attributed to a matrix effect. Lead measurement in paint chip samples by UE/ASV was well-correlated with lead measurement by UE/AA and hot plate digestion/AA procedures. However, precision was lower for lead measurement in paint samples as compared to aerosol samples, and a negative bias was also observed. Lead measurements by UE/AA were compared to lead determinations by hot plate digestion/AA; these data were well correlated and demonstrated no significant bias. It was concluded that the ultrasonic extraction procedure performed equivalently to hot plate digestion. Matrix effects due to paint chip particles resulted in greater imprecision (compared to aerosol samples) as well as negative bias by UE/ASV measurement.

108.

AN INVESTIGATION OF ULTRASONIC EXTRACTION/ANODIC STRIPPING VOLTAMMETRY ANALYSIS OF LEAD IN LABORATORY-PREPARED PAINT FILMS. W. Rossiter, M. Vangel, B. Toman, M. McKnight, A. Signor, M. Baghai Anaraki, NIST, Gaithersburg, MD

A study was conducted to evaluate field-portable ultrasonic extraction-anodic stripping voltammetry (UE/ASV) for quantitatively determining lead in laboratory-prepared paint films when tests were performed by certified lead inspectors trained to conduct UE/ASV testing. The effects of paint lead level, test apparatus, lead pigment type, operator, paint-film substrate, and overlayer applied to the lead-based paint film were investigated. Eighty laboratory-prepared test panels had either white lead or lead chromate pigments with lead levels ranging from 0 mg/cm2 to 3.5 mg/cm2. Five operators, trained to conduct the tests using a protocol developed from the UE/ASV instructions, performed the lead analyses. A major finding was that the measured levels were often considerably less than the levels of the test panels. Depending on the combination of experimental factors, the recovered lead ranged from 28 % to 94 %, with the median recovery being 63 %. These findings are in contrast with previously published field results in which UE/ASV lead recoveries generally ranged from 75 % to complete recovery. In the present study, ASV measurement error did not appear to play a role in the low lead recoveries. A key contributor appeared to be incomplete lead solubilization during specimen extraction. Additionally, operator and substrate factors were found to have significant effects; whereas no effect was found for lead pigment type. A follow-up experiment having five variables—sonicator power, specimen mass, specimen particle size, sonication temperature, and sonication time—was performed to investigate systematically factors affecting UE of lead from laboratory-prepared paint films. UE/ASV analyses were then conducted on specimens from each of 80 paint-film panels under extraction conditions found to enhance lead recovery. Lead recovery for each panel was higher than the mean recovery previously determined by the five operators.

109.

DETERMINATION OF THE FEASIBILITY OF USING THE PORTABLE X-RAY FLUORESCENCE (XRF) ANALYZER IN THE FIELD FOR MEASURING THE LEAD CONTENT OF SIEVED SOIL. A. Armstrong, University of Cincinnati, Cincinnati, OH

Soil samples collected in areas of residential contamination are generally analyzed using atomic absorption spectrometry (AAS) or other laboratory methods. Prior to analysis, the samples are frequently prepared by drying the samples, and then the samples are sieved followed by an acid digestion step, all of which usually takes several days. Previous work has indicated that an FPXRF (field-portable x-ray fluorescence) analyzer is capable of producing soil lead results that are comparable to results by AAS on samples sieved to less than or equal to 125 micrometers. A considerable savings in time and effort would occur if a field method, including sieving, could be developed which does not require laboratory digestion

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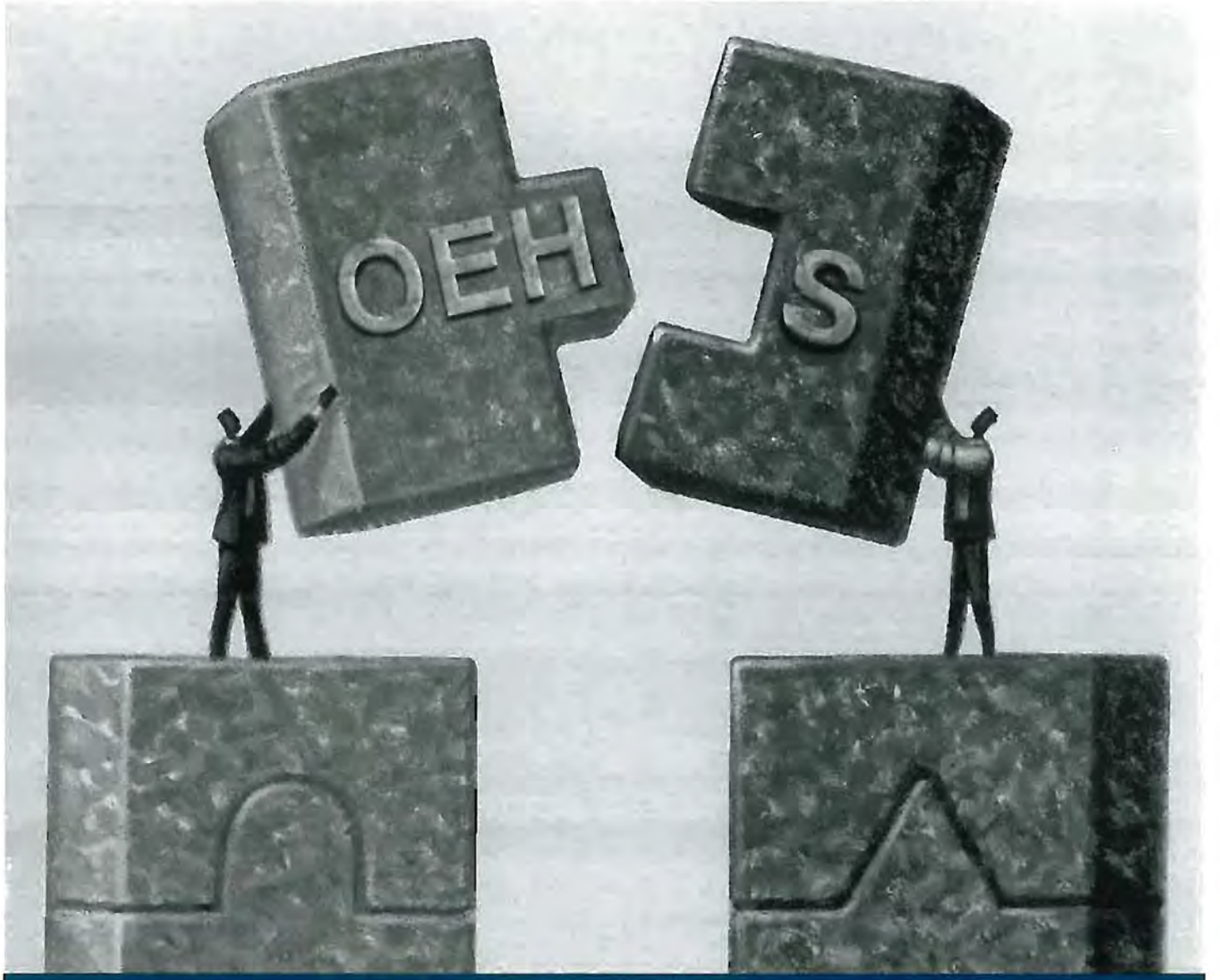

ABSTRACTS

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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