31.

THE VALIDATION OF OCCUPATIONAL EXPOSURE ASSESSMENTS USING INDUSTRIAL HYGIENE MEASUREMENTS. J. Coble, National Cancer Institute, Rockville, MD

Exposure assessment is a critical component of occupational epidemiology studies, however, the accuracy and reliability of exposure estimates can be difficult to evaluate. The validity of exposure assessments for occupational epidemiology studies depends upon the accurate interpretation of objective measurement data if available, as well as subjective inferences based on work history information such as industry, job title and tasks. Exposure misclassification can produce bias and errors in risk estimates, and therefore, the validation of exposure assessment methods is a critical area of research to improve occupational epidemiology studies and quantify health risks from exposure to suspected etiologic agents. Several methods for the validation of exposure assessments using examples from published studies are described. One study used IH measurements to compare the accuracy and precision of two different mathematical models that were used to calculate exposures to acrylonitrile. A second study described the indirect validation of semi-quantitative estimates for exposure to silica based on the detection of a known association with silicosis. A third paper outlined important considerations for the development and validation of exposure assessment methods based on the use of biomarkers. Finally, the design and preliminary results are presented from a validation study that compares exposure estimates based on work history and job specific questionnaires with IH measurements.

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32.

LOW FREQUENCY NOISE AND VIBROACOUSTIC DISEASE: IGNORED IN THE WORK-PLACE. M. Alves-Pereira, New University of Lisbon, Caparica, Portugal; N. Castelo Branco, Center for Human Performance, Alverca, Portugal

Low frequency noise (LFN) (<500 Hz, including infrasound) is an agent of disease that causes vibroacoustic disease (VAD). Research conducted over the past 20 years in both human and animal models has been limited to the aeronautical field (aircraft technicians & mechanics, military & airline pilots and flightcrews, LFN-exposed rodents). Recently, VAD was also identifed in civilian populations exposed to environmental LFN, giving rise to the first documented cases of non-occupational VAD. There are many industries, outside the aeronautical, where LFN is an intergral part of standard operations. These professionals continue unprotected against deleterious LFN, and VAD among them goes undiagnosed. The underlying reason for this state of affairs is the decades-old, but erroneous, assumption that noise only affects the ear. The goal here is to bring to the forum of industrial hygienists, and other related professionals, the problem of VAD and LFN. VAD is a systemic pathology characterized by proliferation of extra-cellular matrices. The pericardium, and other cardiovascular structures, suffer a generalized, overall thickening, readily evaluated through echo-imaging. Signs and symptoms associated with VAD include, in the initial stages (1-9 yrs of occupational exposure), mild to moderate mood disorders, increased aggressiveness and decreased cognitive function, repeated respiratory infections, bronchitis (even in non-smokers), gastrointestinal dysfunction, fatigue and chest pain. In the more acute stages, severe psychiatric disturbances, late-onset epilepsy, severe balance disorders, varicose veins and hemorrhoids, headaches, and intense muscular pain are all common in VAD patients, and are not mutually exclusive conditions in any one individual. Given the association of LFN exposure to on-the-job accidents/incidents, high absenteeism, and early disability retirement within the aeronautical industry, it should be expected that other LFN-generating industries may have the same problem on their hands. Recommendations include entry-level screening for pre-existing LFN-induced pathology, and monitoring LFN-exposed professionals to avoid acute stages of VAD.

33.

EFFECTS OF AGE CORRECTION ON IDENTIFICATION OF STANDARD THRESHOLD SHIFT. J. Franks, NIOSH, Cincinnati, OH

The age correction values provided in Appendix F of the Occupational Safety and Health Administration's Occupational Noise Exposure Regulations (29 CFR 1910.95) were first published in the National Institute for Occupational Safety and Health's noise criteria document in 1972. NIOSH revised the noise criteria document in 1998 and expressly stated that applying population-based age corrections to individuals was statistically inappropriate and counter productive to identifying and preventing noise-induced hearing loss. An analysis of audiometric data from three large industrial sites found that applying age corrections to individuals within the database resulted in a delay in identification of a change in hearing by an average of 3.6 years. That is, a worker will spend an additional 3.6 years in the hearing conservation program without receiving intervention that may prevent additional noise-induced hearing loss. In addition, the age corrections from the OSHA regulations when compared to audiometric data for non-noise exposed workers appear to be over predictive of aging effects. Thus, even when age-correction is correctly used in programmatic analysis, remaining incidences of standard threshold shifts may be under reported.

34.

UPSTREAM PREVENTION OF OCCUPATIONAL NOISE-INDUCED HEARING LOSS (NIHL) VIA INDIVIDUAL EXPOSURE MANAGEMENT. K. Michael, doseBusters USA, Inc., State College, PA; J. Burks, doseBusters USA, Pittsburgh, PA

Hearing conservation programs traditionally rely on limited noise exposure measurements and laboratory estimates of hearing protector (HP) performance to predict individual exposure levels. There are many well-documented problems associated with this approach. First, the on-the-shoulder noise exposure estimates are typically performed on only a small percentage of the workforce, once or twice a year. Individual noise exposures can vary widely from day-to-day, and applying these data to other individuals based on job type increases the potential for inaccuracy. Second, the attenuation provided by HP's to individuals in the field is impossible to predict using any laboratory measurements. Overall individual attenuation is affected by many factors, including the type of HP, the quality of the fitting and the duration it is worn during the noise exposure. A new approach to hearing conservation has been developed utilizing a device called the exposure smart protector (ESP) that measures actual protected exposure, taking into consideration all of these factors that can compromise HP performance. Under this program, exposure measurements are conducted on all noise-exposed workers during every work shift, thus providing a complete noise exposure history. With the use of the ESP, a company can evaluate the success of its hearing conservation efforts for individual workers on a daily basis. In contrast, years of audiometric data collection are required simply to assess the efficacy of a conventional program in protecting the aggregate workforce. The ESP program has been implemented successfully in the coal mining industry where conditions are harsh and noise levels are high. This new approach to hearing conservation, based on the continuous measurement and documentation of individual noise exposures, presents hearing conservationists with the unique opportunity to positively prevent occupational NIHL.

35.

A POWERFUL PARTNERSHIP TO PREVENT SILICOSIS AND NOISE-INDUCED HEARING LOSS THROUGH HANDS-ON TRAINING. D. Morgan, U.S. DOL, Arlington, VA

Dust diseases and hearing impairment are two of the most common occupational illnesses among the 225,000 metal and nonmetal miners working in the United States. Joining forces to achieve a common goal, the Mine Safety and Health Administration (MSHA) and the National Stone, Sand & Gravel Association (NSSGA) maintain a cooperative partnership to prevent silicosis and noise-induced hearing loss among miners. By developing and promoting a 3-day instructional pro-

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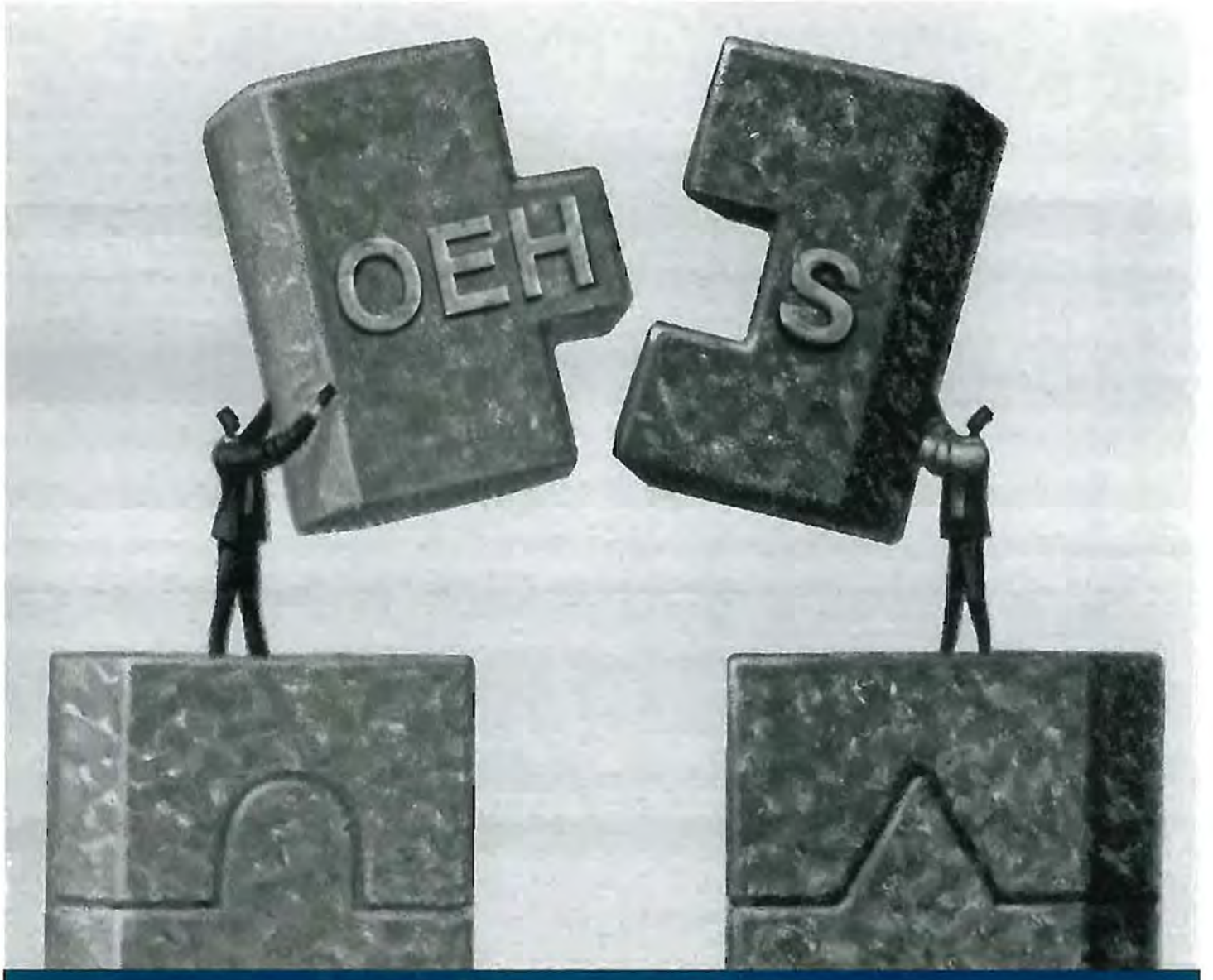

ABSTRACTS

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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