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AN INTERNATIONAL OHSMS STANDARD: NATIONAL/REGIONAL UPDATE, AND REPORT FROM IOHA/ILO ACTIVITIES. C.F. Redinger, University of Michigan (Erb Environmental Management Institute), Washington, DC; D. Dyjack, Loma Linda University, Loma Linda, CA; S. Levine, University of Michigan, Ann Arbor, MI

Despite the rejection of an international occupational health and safety management system (OHSMS) standard by the International Organization for Standardization (ISO), standards-development activities continue on a national and regional basis. Furthermore, a partnership to move forward with an international standard was discussed between members of the International Labor Organization (ILO) and the International Occupational Hygiene Association (IOHA) at IOHA's Technical Conference in 1997 in Crans Montana, Switzerland.

The national and regional developments since the ISO meeting in 1996 are reported along with the ILO and IOHA activities. Specifically, activities in the European Union and member countries are reported. IOHA's OHSMS Working Group structure and initial standard language are reported. It is concluded that an international OHSMS standard can proceed independent of ISO and that these activities suggest that an international OHSMS standard is viable and needed.

APPLICATION AND USE OF STRATEGIES, MODELS, AND TOOLS FOR ASSESSING EMPLOYEE EXPOSURES

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RECONSTRUCTION OF PAST MERCURY EXPOSURES AT A CHLORALKALI PLANT. P.L. Williams, Environmental Health Science, University of Georgia, Athens, GA; M. Pierce, Glynn County Health Department, Brunswick, GA; A. Sanders, H. Frumkin, Rollins School of Public Health of Emory University, Atlanta, GA

This project involved the historical reconstruction of employee mercury exposure at a large chloralkali facility that was in operation from 1956 to 1994 in Brunswick, Georgia. Through extensive interviews with former workers and a review of site records, all jobs were classified into one of 16 exposure categories, and the dates of process changes were identified. Exposures for each job category, at each period of the plant's operations, were then reconstructed using several data sources: thousands of direct readings collected by facility personnel from 1967 through 1988; passive and active air sampling data collected by NIOSH in 1987 and 1988; active sampling data from OSHA inspections in 1987 and 1992; and passive and active air sampling data collected in a 1988 university study of the plant. In addition, mercury air concentrations were estimated from modeling using room air change rates and known mercury losses within the facility. From these sources, a job-time period-exposure matrix was created, and the individual exposures of 155 former workers were calculated. Within an exposure category, the study found that mercury air concentrations were fairly constant for the first 20 years of the facility's operation but began to increase in the late 1970s. The highest exposures occurred from 1987 until the plant closed in 1994, with some exposure categories having time-weighted average mercury exposure greater than 100 mg/m^3. This information provided the exposure assessment in a concurrent epidemiology study assessing the effects of mercury exposure.

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FLOCK WORKERS' LUNG: THE ONGOING SEARCH FOR AN ETIOLOGIC AGENT. K.T.H. Durand, University of Washington, Seattle, WA; D. Kern, Memorial Hospital of Rhode Island, Pawtucket, RI

Two workers from the same textile plant were referred to the Memorial Hospital of Rhode Island's Occupational Health Service (MHRI) for evaluation of possible work-related interstitial lung disease (ILD). This prompted an investigation, which has received international media attention and is ongoing. The purpose of this presentation is to provide the industrial hygiene community with some of the details of the investigation and with available exposure information. The disease outbreak, which eventually included eight workers was being investigated simultaneously by MHRI and NIOSH. The MHRI investigation focused on gathering information about the processes involved in the manufacture of nylon flock and flocked fabric; potential etiologic agents and their potential toxicity; defining the disease process; and on searching for temporal, spatial, and/or dose relationships between individual exposures and disease. Air samples were collected and analyzed gravimetrically for total and respirable dust and by SEM in order to characterize the aerosol. Short-term total dust concentrations were as high as 82 mg/m^3 during cleaning operations. Total dust concentrations throughout the plant ranged from 0.4B24 mg/m^3. Respirable particulate similar in chemical composition to the fiber finish was found in these samples. Air concentrations of formaldehyde and ammonia were negligible. Samples were collected for volatile organics using thermal desorption tubes, and concentrations ranged from trace amounts to 316 ppb. Although NIOSH results cannot be released until publication of the HHE, they sampled for dust, metals, nitrogen oxides, formaldehyde, various solvents, total hydrocarbons, bioaerosols, and endotoxin. The cause of "flock-workers' lung" is yet to be determined, although attention is currently focused on respirable fragments of nylon fiber and its three-component organic finish. A complex job exposure matrix is being constructed to further evaluate possible exposure-response relationships.

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COMPARISON OF THREE METHODS TO CONVERT CHINESE MINING DUST EXPOSURE INTO RESPIRABLE FRACTION. P. Gao, B. Chen, F. Hearl, D. Schwerha, Z. Zhuang, S. Soderholm, NIOSH, Morgantown, WV; W. Chen, J. Chen, Tongji Medical University, Wuhan, People's Republic of China

There is a rich historical Chinese total dust database being used in an ongoing joint Chinese/NIOSH epidemiological study to clarify the exposure-response relationship for the development of silicosis. In order to apply these data to American standards, conversion factors are needed between historically measured Chinese total dust data and respirable dust levels. In 1988, as a part of this collaboration, airborne dust samples were collected side-by-side in 20 metal mines and 9 pottery factories in China using nylon cyclones, multistage "cassette" impactors and filters. Total dust concentration was gravimetrically measured based on the Chinese dust sampler, and particles on its filter were sized microscopically.

The study yielded three different estimates of the conversion factor from Chinese total dust to respirable dust: (1) the ratio of respirable concentration by cyclone to the Chinese total dust concentration (geometric mean 0.363), (2) the ratio of respirable concentration by impactor to the total dust concentration (geometric mean 0.229), and (3) the values calculated by using the Hatch-Choate equation based on the microscopic sizing data (geometric mean 0.032). Multiple analyses of variance (MANOVA) reveals that, with a fixed sampling/analysis method, respirable fractions were not significantly different among the different job titles within each industry. MANOVA also indicates that respirable fractions among the mines and industries were not significantly different when the cyclone or impactor measuring data were used, but were significantly different when the microscopic data were used, being significantly lower in the pottery industries (p value=0.048). Thus, it is concluded that conversion factors estimated from different methods are quite different.

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SIZE DISTRIBUTION, PARTICLE NUMBER, AND SURFACE AREA OF BERYLLIUM OXIDE PARTICLES IN A BERYLLIA CERAMICS PLANT. D.A. Breitigam, Brush Wellman Inc., Elmore, OH; F. Akbar-Khanzadeh, Medical College of Ohio, Toledo, OH

Recent epidemiological studies indicated that the daily weighted average methods used for beryllium exposure assessments, which utilize total mass, did not adequately describe a typical dose-response relationship. This study was designed to discover if other characteristics of airborne beryllium oxide (BeO), such as size distribution, particle number, and surface area are toxicologically significant. Six work cells, including material preparation, lapping, machining, pressing, extrusion, and laser in a beryllia ceramics plant located in Tucson, Arizona, were evaluated to determine various particle characteristics. Concentration, particle number, and surface area of the BeO aerosol was characterized by using two cascade impactors, an Andersen Cascade Impactor (ACI) and a Microorifice Uniform Deposit Impactor (MOUDI). The ACI was used to assess employee exposure, whereas the MOUDI was used to determine general area conditions. The range of results from the ACI were: total mass from 0.26 to 1.30 mg/m^3, particle number from 1.0 H 10^7 to 3.7 H 10^7, and surface area from 4.4 H 10^6 to 1.0 H 10^7 mm^2. The range of results from the MOUDI were: total mass from 0.03 to 0.04 mg/m^3, particle number from 1.1 H 10^9 to 2.0 H 10^9, and surface area from 2.6 H 10^6 to 4.2 H 10^6 mm^2. ACI sampling results indicated statistical differences between various work cells

Abstracts

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