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LIMITATIONS OF WEIGHT CHANGE TECHNIQUE FOR EVALUATION OF PASSIVE DOSIMETERS. L. Monteith, University of Washington, Seattle, WA

The continuous recording of the weight of passive dosimeters has been used to determine their sampling characteristics. The advantages and limitations were determined as follows: the most versatile application is that the weight change followed the sorption process and showed the response of the sampler to changes of concentration, interferences or conditions that can affect the accuracy and precision. No other technique can actively show the process of badge adsorption. The speed with which the badge can follow changes of concentration determines how applicable the badge is for short-term exposures. The weight change curve shows the lag time and response time in the uptake to corresponding changes of concentration. The apparatus was a continuous recording electrobalance, a controlled air flow system, and a dynamic vapor generator. The limitations of the technique are the masking effects of moisture gain or loss, of one compound on another in mixtures and of temperature changes. When characterized and taken into account, these disadvantages were turned to an advantage to measure the status and effect of moisture on a badge, or the combined effect of multiple compounds, or the net weight change as a means of evaluating reverse diffusion. Each limiting effect, including interference and reverse diffusion, can be followed by changes of weight slope. The effectiveness of using reverse diffusion of a pre-sorbed analyte to determine the total sampling time was evaluated. The disadvantage of one badge at a time limits the technique for the full matrix validation protocols; however, weight change can furnish critical answers to questions related to validation.

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VALIDATION OF A PASSIVE SAMPLER FOR KETONES. S. Tsai, S. Que Hee, UCLA, School of Public Health, Los Angeles, CA

O-(2,3,4,5,6-pentafluorobenzyl) hydroxylamine hydrochloride (PFBHA) has been used to analyze aldehydes in water because of its fast quantitative reaction to form oximes suitable for detection at the picogram (pg) level by gas chromatography/mass spectrometry (GC/MS) and gas chromatography/electron capture detection (GC/ECD). The PFBHA method also has been used to chemisorb aldehydes in air samples by dynamic sampling as well as passive sampling. The present aim was to validate a new ketones passive sampler for personal sampling in the environmental/industrial hygiene field. Cyclohexanone, diethyl ketone, ethyl butyl ketone, methyl n-amyl ketone, methyl n-butyl ketone, methyl ethyl ketone, methyl isopropyl ketone, and methyl propyl ketone were tested. A 13-mm diameter and 0.2-cm-thick pellet of PFBHA coated Tenax GC (10%, w/w) was made by a hand press. The sampler has a silicone membrane on top and a diffusion path length of 1.1 cm. The sampling constant was determined by exposures at known face velocities (20 to 70 fpm) at known vapor concentrations about the permissible exposure limit (PEL) as generated by a syringe pump at constant injection rate into pure air of known flow rate, and diluted appropriately before the exposure chamber. The PFBHA-ketone oximes were desorbed by hexane, and determined by selected ion monitoring GC/MS at m/z 181. The desorption efficiencies for wet ketones spiking were 87.2 ± 7.0%, cyclohexanone; 91.1 ± 3.9%, diethyl ketone; 98.0 ± 3.2%, ethyl butyl ketone; 93.3 ± 2.7%, methyl n-amyl ketone; 107.00 ± 0.14%, methyl n-butyl ketone; 90.0 ± 4.0%, methyl ethyl ketone; 92.8 ± 5.6%, methyl isopropyl ketone; and 92.5 ± 2.6%, methyl propyl ketone. The experimental sampling rates in mL/min were 4.07 ± 0.49, cyclohexanone; 6.30 ± 0.59, diethyl ketone; 6.31 ± 0.31, ethyl butyl ketone; 3.78 ± 0.25, methyl n-amyl ketone; 3.43 ± 0.19, methyl n-butyl ketone; 6.48 ± 0.64, methyl ethyl ketone; 4.37 ± 0.43, methyl isopropyl ketone; and 4.57 ± 0.17, methyl propyl ketone.

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FIELD INVESTIGATION COMPARING DIFFUSION BADGE AND CHARCOAL TUBE MONITORING FOR STYRENE. R. Dobos, Marsh Inc., Atlanta, GA

This investigation was completed to compare the results of diffusion monitors (passive sampling) and charcoal tubes (active sampling) in three fiberglass boat manufacturing plants since these are the two most common methods available for monitoring styrene. Time weighted average (TWA) results for 15 paired samples (12 breathing zone and 3 area) were compared. Organic vapor monitors (with a backup section) and charcoal tubes (with 400 mg and 200 mg charcoal in the sampling and backup sections, respectively) were utilized. Low-flow personal sampling pumps calibrated at rates of between 0.05–0.07 lpm were used for the active sampling. The diffusion badges and charcoal tubes were placed on the same side of the employees' lapel, approximately one inch apart, and were attached to the collar, approximating the breathing zone. Two charcoal tubes were used during the sampling period to avoid breakthrough. Only one diffusion badge was used for the entire sampling period. Samples were analyzed using NIOSH 1501. The sampling rate for the monitors was 28.9 ± 1.4 cc/min. Linear regression analysis was used to compare the TWA results and showed a strong predictive relationship and an R squared value of 0.96. The diffusion badges had 31% higher results than the charcoal tubes across the range of concentrations 5.6 ppm to 150 ppm. Paired t-test validated this inference by demonstrating statistically significant differences between the means. Practitioners in the reinforced plastic industry need to know that using diffusion badges, for ease of use and collecting larger numbers of samples, will yield 31% higher TWA results than charcoal tubes attached to personal sampling pumps.

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SOUND PRESSURE LEVELS OF SELECTED CONSTRUCTION TASKS. C. Johnson, M. Kerr, L. Brosseau, University of Minnesota, Minneapolis, MN

Traditional dosimetry during an 8-hour work shift is not representative of noise exposure for construction workers due to variability in tasks performed and worksite locations. Models can be used to estimate 8-hour time weighted average (TWA) exposures if sound levels of involved tasks are known. Sound level data for construction tasks are limited. The purpose of this study was to determine equivalent sound pressure levels (Leq) of selected construction tasks to provide data for hearing conservation efforts and training for construction workers. The noise measurements focused on three target groups of construction workers: (1) carpenters, (2) roofers, and (3) construction laborers. The tasks sampled were selected to include activities recognized by the workers as "loud" and activities that the workers did not think were noise problems. Samples were taken using a Type 2 sound level meter and included Lmax and Leq measurements. The levels were then compared to the recommended exposure limit (REL) of 85 dBA and ceiling level of 115 dBA suggested by the National Institute of Occupational Safety and Health (NIOSH). The reference duration for each task was calculated using a 3-dB exchange rate. Most tasks considered "loud" by the workers were well above the REL. These included using powder actuated tools (130 dBA, impulse), cutting steel with a chop saw (114 dBA, reference duration: 1.2 minutes), and cutting an asphalt roof (95.9 dBA, reference duration: 38.7 minutes). Tasks that were not thought to be noise problems, such as screwing drywall into steel studs (96.5 dBA, reference duration: 33.7 minutes) were also above the recommended levels. The data collected during this study demonstrate the need for more attention to noise exposures in construction and provide information on relevant construction tasks for use in training programs and hearing conservation program implementation.

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A COMPARISON OF EXPOSURE METRICS FOR OCCUPATIONAL NOISE EXPOSURES IN THE CONSTRUCTION INDUSTRY. R. Neitzel, J. Camp, N. Seixas, J. Yost, University of Washington, Seattle, WA

This study summarizes the results of an extensive assessment of occupational noise exposures in the construction industry, and overcomes many of the shortcomings in the existing literature. A comparison is made between exposures measured using 3- and 5-dB exchange rates (ERs), allowing for evaluation of noise variability in construction work and the potential impact of proposed noise regulations on the industry. Three hundred thirty-eight (338) noise exposure samples were collected from 133 construction workers in four trades: carpenters, laborers, ironworkers, and operating engineers. The samples were obtained from four sites over a 22-week period, with each site sampled at least 12 times on a randomly chosen date. Up to 10 volunteers were monitored for an entire workshift on each sampling day using datalogging noise dosimeters, which recorded both daily time weighted average (TWAs) and one-minute averages. During the workday, workers completed a questionnaire detailing the timing and number of tasks performed and tools used throughout the day. Comparisons were made between exposures measured using the OSHA Hearing Conservation exposure metric, the 1996 NIOSH/ISO metric, and a modified NIOSH/ISO metric to examine the effects of differing ERs and other parameters on construction noise exposures. The mean OSHA TWA for 338 samples was 82.8 dBA (SD 6.8 dBA; range, 61.6–99.3 dBA), while the mean NIOSH/ISO TWA for 174 samples was 89.7 dBA (SD 6.0 dBA; range, 76.1–103.9 dBA). Of OSHA TWAs, 40% exceeded 85 dBA, and 13% exceeded the 90-dBA OSHA permissible exposure limit (PEL), while 82% of NIOSH/ISO TWAs exceeded the 85-dBA NIOSH REL, and 45% exceeded 90 dBA. Regression models were developed to identify work characteristics associated with elevated exposure levels, and to identify areas where control strategies could produce the greatest exposure reduction. The data indicate that workers in the trades examined are frequently

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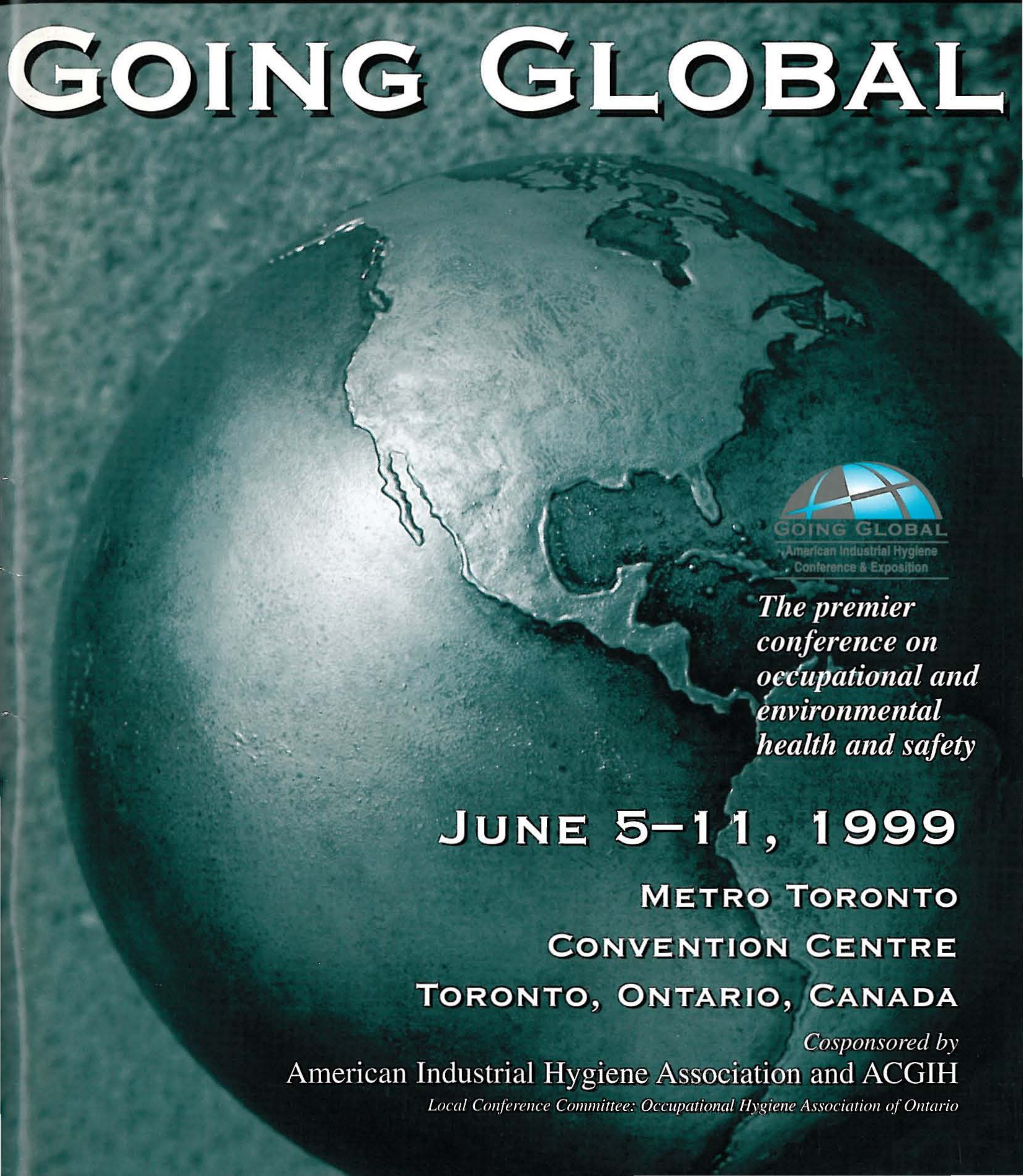

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