Abstract Book

AIHce

INNER HARBOR BALTIMORE

May 21-26, 2016 → AIHce2016.org

www.AIHce2016.org

2016

Pathways to Progress

AIHce 2016

CO-SPONSORED BY AIHA® & ACGIH®

zone for young children) and 5 feet both pre- and post- active disturbance of settled dust on child's bedroom floors. The bedroom floor was disturbed using a metal handled spatula.

Results: T-test results indicated that mean particle concentrations for Undisturbed vs. Disturbed particle concentrations, at the 2 foot heights showed more variability between 1.0 um to 10 um ($p=0.05$ to $p<0.01$) particle sizes as compared to 5 feet. When comparing Disturbed vs. Undisturbed particle concentrations, a statistical relationship existed between particles of the same size (Rho=0.67-0.99). Smaller particles, < 2.0 um, showed a strong statistical relationship with one another.

Conclusions: Using a combination of aggressive and non-aggressive particle sampling techniques at different heights, may provide a better profile of the particle concentrations present in the environment. The research indicates a slight relationship does exist between limited allergens and particles sampled. However, particle sampling alone may not indicate or determine what type of allergens may be present in the environment. Additional research needs to be performed to better understand allergen behavior when surfaces are disturbed.

SR-113-02

Historical Levels of Benzene, Hydrogen Sulfide and Noise to Demonstrate Exposure Trends in a Petroleum Refinery

F. Akbar-Khanzadeh, M. Chambers, S. Milz, A. Ames, and M. Valigosky, UT HSC College of Medicine, Toledo, OH

Objective: Petroleum refineries are examples of workplaces with multiple operations where exposure data are routinely collected and accumulated over the years without having a comprehensive analysis performed. If the historic data are compiled and analyzed, they can be used to examine exposure trends, build up predictive models or conduct epidemiological studies. This presentation demonstrates the application of historic data in evaluating exposure trends.

Methods: In a petroleum refinery, the results of exposure monitoring to harmful agents, collected over the years of 1980 to 2011, were compiled. Benzene, hydrogen sulfide and noise were chosen as indicators of overall exposure in the refinery and their levels and characteristics were entered into a statistical datafile. The exposure monitoring in this facility, which continuously keeps up with new technology, had been performed according to appropriate standard methods and under supervision of experienced industrial hygienists.

Results: The data analysis showed that the benzene concentration ranged from 0.01 to 14 mg/m^3 with a mean concentration of 0.24 mg/m^3; no significant variation observed in benzene concentrations at major locations of the refinery. Hydrogen sulfide concentration ranged from 0.08 to 220 mg/m^3 with a mean concentration of 3.5 mg/m^3. Mean concentration for hydrogen sulfide by location revealed that in an operator position that covers multiple units had the highest exposures at 17 mg/m^3, followed by the Saturated Gas Unit (7.6 mg/m^3), and Coker Unit (1.5 mg/m^3). Noise levels ranged from 43.1 to 102 dBA with a mean level of 80.3 dBA. Locations with the higher mean noise levels were the Crude Atmospheric Distillation Unit (88 dBA), Boiler (87.3 dBA), and Liquid Petroleum Gas Storage (86.3 dBA).

Conclusions: A linear regression analysis by year indicated that over time benzene and hydrogen sulfide concentrations remained almost unchanged; however, noise levels increased slightly but significantly ($p < 0.05$).

SR-113-03

The Log-Binomial Model for Exposure Data Analysis

T. Mathew, University of Maryland Baltimore County, Baltimore, MD; K. Krishnamoorthy, University of Louisiana at Lafayette, Lafayette, LA

Objective: In industrial hygiene and environmental applications, binary data are very common: the presence or absence of a health condition, the exceedance or non-exceedance of an OEL, etc. Such responses usually depend on exposure levels and other covariates, and logistic regression is extensively used to model the probability of a positive response. Typically, odds ratios (OR) are reported in the context of binary outcomes. For an outcome that is not rare, the log-binomial model is sometimes used for modeling exposure-response relationships and for estimating the risk ratio, also referred to as the prevalence ratio (PR). For such outcomes, the PR is a more intuitively interpretable measures of association than the OR. However, the log-binomial model presents considerable difficulties for data analysis, even for large sample sizes, since the calculation of the maximum likelihood estimates is problematic. Our objective is to explore alternative methodology for the accurate analysis of exposure data under the log-binomial model.

Methods: The methodology that we shall explore is an old and underutilized approach in statistics, namely, the fiducial approach. The fiducial concept has undergone a recent revival and is now recognized to be important in applications. The fiducial method can be easily adopted to the log-binomial model. The fiducial methodology and its implementation will be explained for estimating the prevalence ratio and for testing hypothesis in order to assess possible association between an exposure variable and a health outcome.

Results: Simulation results show that the proposed methodology does provide accurate results. Apart from simulation results, the methodology will be illustrated using the analysis of a data set on the prevalence of carpal tunnel syndrome among employees at a poultry processing plant.

Conclusions: For testing hypothesis concerning the association between an exposure variable and a health outcome, the proposed fiducial approach provides an accurate test. The fiducial approach also provides considerable computational advantage, since it does not require the computation of maximum likelihood estimates.

SR-113-04

Preliminary Results on Testing a Field-Based Respirable Silica Monitoring Approach in Surface Copper Mines

E. Cauda and L. Chubb, CDC/NIOSH, Pittsburgh, PA; R. Reed and E. Lutz, University of Arizona, Tucson, AZ

Objective: The first objective is to assess the performance of the Direct-on-Filter (DoF) FTIR technique for the estimation of crystalline silica in respirable dust samples collected in

surface copper mines. The adoption of this technique could allow field-based silica monitoring in the future. The second objective is to investigate the variability of the crystalline silica content in the respirable dust present in surface copper mine operations in Arizona.

Methods: Area samples of respirable dust were collected at several copper mines in Arizona, in different areas of the mine except for the pit. Primary and secondary crushers, together with the mill were selected as preferred sampling areas for the high levels of respirable dust and crystalline silica generally present in those environments. After the collection, the samples were analyzed with a portable FTIR set up for DoF analysis for the estimation of collected crystalline silica. Because this approach does not destroy the sample, the same samples were then analyzed by an accredited laboratory with the X-ray diffraction NIOSH 7500 method for the quantification of crystalline silica. The accuracy of the DoF-FTIR estimation compared to the results of the NIOSH 7500 method was evaluated for each sample and analyzed statistically within the same set and among sets collected in different mines. The identification and quantification of the minerals present in the respirable dust in different areas of every mine was also conducted to investigate the effect of geological confounders in the silica quantification with the FTIR method. Finally, the respirable crystalline silica results obtained were used to investigate the spatial variability of both respirable crystalline silica concentration within the same mine and crystalline silica content in the dust among different mines.

Results: The estimation of the DoF-FTIR technique correlates well with the results of the standard NIOSH 7500 method. The accuracy of the estimation is independent from the amount of the silica present in the samples collected in different mine. More comprehensive analysis will be given at the meeting. Finally, the DoF-FTIR technique showed an LOQ for the estimation of silica of 15 micrograms.

Conclusions: The exposure to respirable dust containing crystalline silica is a recognized occupational hazard in mining. In surface copper mines, activities in the crusher and mill areas are known sources of respirable dust with mass concentrations that can vary in time and can rise above action levels. In general, the monitoring of crystalline silica dust is still conducted with the use of traditional hygiene practices with limitations in terms of timely information available for the adoption and optimization of control technologies. The use of a field-based silica monitoring approach can allow operators to obtain early detection of concentration levels above the action limit.

SR-113-05

Toluene Diisocyanate Exposure: Exposure Assessment and Development of Cross-Facility Similar Exposure Groups Among TDI Production Plants

B. Doney, P. Middendorf, and W. Miller, CDC/NIOSH, Morgantown, WV; T. Feeley, Covestro LLC, Pittsburgh, PA; R. D'Angelo, Covestro LLC, Baytown, TX; L. Martinez, BASF Corporation, Geismar, LA; J. Cikalo, Dow Chemical Company, Midland, MI

Objective: The objective was to characterize workplace toluene diisocyanate (TDI) exposures in U.S. TDI production plants using standardized industrial hygiene exposure assessment procedures for use in a prospective epidemiologic study of occupational asthma.

Methods: A uniform exposure assessment strategy was developed by a team of industrial hygienists from the National Institute for Occupational Safety and Health (NIOSH) and from representatives of each participating plant who were knowledgeable of the plants processes and operations. To provide the exposure data needed to achieve the study's aims, the assessment strategy included: development of similar exposure groups, identification of high potential exposure tasks, quantitative and qualitative exposure assessment, and the utilization of standardized sampling and analytical methods. Air samples were collected with calibrated personal sampling pumps and analyzed using a method equivalent to the OSHA 42 Method for measuring airborne personal exposures to TDI.

Results: A total of over 2600 samples were collected. 1594 representative routine full shift time-weighted average (TWA) and 755 routine short term high potential exposure task (HPET) air samples were collected among groups with similar job titles across three TDI plants over a nearly seven-year period. Data derived similar exposure groups (SEGs) were developed across the plants based on TWA sampling using cluster analysis. Individual cumulative exposure estimates were developed based on the cross-facility similar exposure groups. The arithmetic mean TWA exposure was 0.65 ppb. Without adjusting for the use of respirators, the highest TWA exposures occurred among field operators, TDI loading, and TDI drumming SEGs. Of the 1594 TWA routine samples, 35 were > 5 ppb and of the 755 HPET routine samples, 83 were > 20 ppb. Workplace routine TWA exposures to TDI were adequately characterized, but HPET exposures were inadequately sampled.

Conclusions: The TDI exposure assessment of the primary producers of TDI in the U.S. was one of the most complete to date. The measured exposures can be used to support epidemiologic analysis of the relationship between exposures to TDI and asthma.

SR-113-06

Estimates of Occupational Inhalation Exposures on the Four Rig Vessels During the Deepwater Horizon Oil Release Cleanup

T. Huynh, University of Alabama at Birmingham, Birmingham, AL; G. Ramachandran C. Groth, and S. Banerjee, University of Minnesota, Minneapolis, MN; A. Blair, National Cancer Institute, Gaithersburg, MD; M. Stenzel, Exposure Assessment Applications, Arlington, VA; D. Sandle, L. Engel, and R. Kwok, National Institute of Environmental Health Sciences, Research Triangle Park, NC; P. Stewart, Stewart Exposure Assessments, LLC, Arlington, VA

Objective: After the 2010 Deepwater Horizon oil release, the National Institute of Environmental Health Sciences initiated an epidemiological study (GuLF STUDY) to investigate the potential adverse health effects associated with the oil spill response and clean-up work. One component of the study, a quantitative exposure assessment, is critical because it allows the investigation of the exposure-disease relationship.