Podium Session 103
Laboratories, Analytical and Research

Monday, June 18, 2012, 10:30 AM – 12:30 PM

Papers CS-103-01 – CS-103-06

CS-103-01
Implementation of High Hazard Operating Procedures for Highly Hazardous Substances in Chemical Laboratories

M. Brinton, Weill Cornell Medical College, New York, NY.

Situation/Problem: The Occupational Safety and Health Administration's "Occupational Exposures to Hazardous Chemicals in Laboratories" standard requires that all laboratories that store or use Highly Hazardous Substances (HHSs), must develop and implement a High Hazard Operating Procedure (HHOP) for each substance. However, the size and/or complexity of many institution's laboratories, the ever-changing nature of research, the high turnover rate of personnel in academic laboratories and there vast chemical inventories results is widespread non-compliance and/or written procedures that do not effectively address the hazards.

Resolution: In order to rectify this condition, Weill Cornell Medical College implemented a HHOP program that requires each lab to review its inventory and complete an assessment form for all HHSs which is a pre-requisite to the lab's ability to apply for funding. Assessments are reviewed by Safety Specialists and compared to existing experimental protocols or Standard Operating Procedures to assess where exposure hazards must be controlled. Once the HHOP is approved individual chemical containers are marked with a distinctive label indicating that a HHOP must be reviewed prior to that chemicals use and signage is placed in the lab to educate all staff on the requirements for using these chemicals.

Results: By requiring labs to complete the HHOPs as part of its funding applications and requiring the heads of labs to personally review and sign each one, hundreds of HHOPs were created in the first 12 months of the program. These HHOPs provide guidance to users of hazardous chemicals which are matched to the specific work being done at each location.

Lessons Learned: In the field of Biomedical research, few laboratory workers or researchers have expertise in chemical hazards such as reactivity or toxicity. In order to enable them to develop these procedures, additional resources were created and collaboration with Safety personnel is required.

SR-103-02
Detection of Micro-Holes and Tears in Disposable Nitrile Gloves

A. Mathews, S. Que Hee, UCLA Public Health-Environmental Health, Los Angeles, CA.

Objective: Development of a method to detect micro-holes/tears in disposable nitrile gloves.

Methods: Tears of varying size were made in partially inflated nitrile gloves using 21, 22, 26s, 30, and 33 gauge 2-point style stainless steel needles. The lengths of these tears were measured using an Aven Mighty Scope of 500x magnification and with Microviewer software. The Frazier air permeability tester (FAPT) attachments were designed to create a holding compartment for glove materials, the Glove and Air Vacuum (GAV) dome. Gloves were loaded into the dome in one of two modes. The first used a glove piece of at least 2.5-inches in diameter loaded into an adapter. The dome was attached to the air permeability tester and the loaded adapter affixed on top. A 6.5–7 in-water vacuum was applied by the FAPT and 50 mL of water poured into the adapter. For the whole glove mode, the whole glove was placed into the GAV dome that is then attached to the FAPT at a vacuum of 11–12 in-water before 600 mL of water is added. In both modes the vacuum was held for 90 seconds and the amount of water penetrating through the glove material was weighed and a flow rate calculated.

Results: All punctures resulted in tears in the glove material. The method currently has a sensitivity of 131.6±0.01 μm tear and flow rates of 2.48±0.4 μL/min for glove pieces, 28.15±2 μL/min for whole-glove palm, and 0.250±0.01 μL/min for whole-glove finger regions with potential as a qualitative method for smaller holes.

Conclusions: The developed GAV dome method shows promise as a quantitative and qualitative technique to detect micro-holes/tears in whole or pieces of disposable gloves.

CS-103-03
Development of Statewide Consensus Safety Guidelines for Nanomaterials Research in California

L. Gibbs, M. Dougherty, Stanford University, Stanford, CA.

Situation/Problem: Use and application of engineered nanomaterials (ENMs) in research laboratories has grown substantially beyond developing new nanomaterials to use in a wide spectrum of academic research ranging from materials science and animal studies to human clinical uses. Traditionally, EH&S professionals rely on quantifiable human health risk assessment to apply risk programs. With ENMs there are considerable gaps in the knowledge needed for quantifying the risk of engineered nanomaterials. This requires risk management decisions and exposure control procedures to be developed and applied when the information needed for quantitative risk assessment is limited.

Resolution: This presentation presents the results of a collaborative effort between California higher education, state regulatory agency and NIOSH to review the scope and current uses of engineered nanomaterials in a variety of academic research areas and derive practical and safe practices for academic research involving engineered nanomaterials.

Results: Written guidelines developed from this effort are available on-line.

Lessons Learned: Additionally, a review of the work group process and challenges of using this collaborative approach, as well as how issues were resolved will be addressed.

SR-103-04
Permeation of Benzyl Alcohol through Disposable Nitrile Gloves

S. Takaku-Pugh, S. Que Hee, University of California, Los Angeles, Los Angeles, CA.

Objective: The objective of this study was to assess the permeation of liquid benzyl alcohol through a disposable nitrile glove.

Methods: This study utilized the American Society for Testing and Materials F739-96 closed-loop permeation method. The glove material from the palm was cut into 3-inch diameter circles, and conditioned at 54±3% relative humidity at room temperature. The weight and thickness of glove materials were recorded before and after permeation, the latter after reconditioning. Fourier transform infrared reflectance spectroscopy (FTIR) was also used to compare the inner and outer glove surfaces before and after permeation. Each glove material was inserted into an individual 1-inch permeation test cell. 10-mL of 99.8% benzyl alcohol was placed into the challenge side of the cell, and 10 mL of deionized water into the collection side. Four cells were immersed into a water bath at 35.0±0.4°C with a shaking speed of 8.52±0.05 cm/sec. To quantify the permeated benzyl alcohol, 0.1 mL of water was sampled every 5 min from the collection side until the glove degraded at around 40 min. The water sample was analyzed by gas chromatography-mass spectrometry with 4-bromophenol as an internal standard using m/z 79 and m/z 172 selective ion monitoring.

Results: The percent differences of the thickness and weight before and after permeation were less than 10 %. The average steady state permeation rate, lag-time, and diffusion coefficient were 3.43±0.65 $mg/cm^2/min$, 14.95±0.71 min, and (1.96±0.19) x 10^{-6} cm^2/min respectively. FTIR analysis of the inner and outer glove surfaces after permeation indicated reflectances around 700 and 750 cm^{-1}, characteristic of benzyl alcohol.

Conclusions: The disposable nitrile gloves do not protect skin against benzyl alcohol since the normalized breakthrough time threshold of 250 ng/cm^2 occurs in less than 5 min, and the steady state permeation rate is classified as poor protection.

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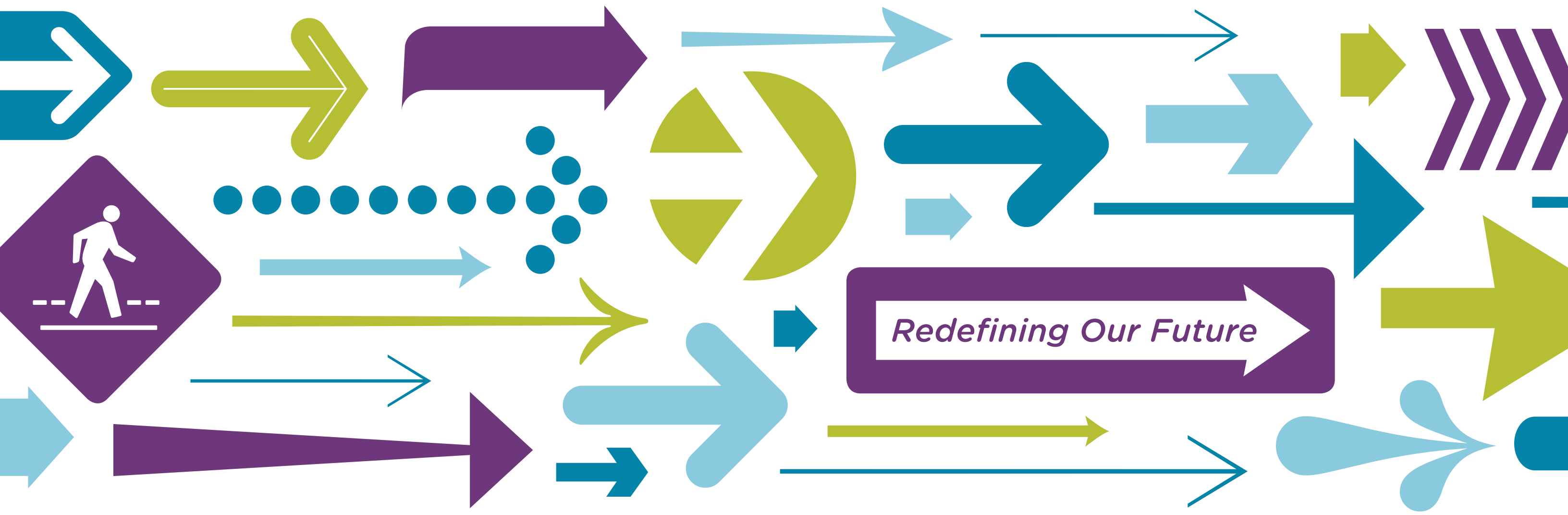

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