alcohol fiber. Because no objective determination of the performance or characteristics of these different wiping media were previously available, several practical aspects of these wipes were measured, such as size, tear resistance, wetness, and drying rate. A laboratory study was also performed to assess the recovery of lead oxide dust from hands at two loading levels. Up to four successive wipes were taken during each hand wiping and analyzed individually. The results of this study indicate that only about 50% of the total lead loading is recovered with the first wipe but that up to 80% recovery could be obtained with three successive wipes. Precision was better when a composite sample of multiple consecutive wipes were taken, instead of only one. Ghost wipes contain about twice the moisture as the cellulosic wipes, even though the dry weight and size are approximately the same. The drying rate for each wipe media are essentially the same. Tear resistance, as measured in grams for a 1.24" strip of Wash & Dry, Palintest, and Ghost wipes were 381, 1469, and 1975, respectively. Abrasion resistance results paralleled tear resistance. The results of these performance measurements should be helpful for selecting wipe media for environmental and industrial hygiene surface and skin sampling.

## 13

**A COMPARISON OF X-RAY FLUORESCENCE AND WET CHEMICAL ANALYSIS OF AIR FILTER SAMPLES FROM A BRONZE FOUNDRY.** M. Harper, B. Pacolay, NIOSH/HELD/EAB, Morgantown, WV; M. Andrew, NIOSH/HELD/BB, Morgantown, WV.

Lead is commonly added to bronze to improve casting. Personal samples for exposure to airborne lead in the presence of copper, iron, and zinc were taken at a bronze casting foundry. Samplers used were the closed-face 37-mm plastic filter cassette, the 37-mm GSP sampler, the 25-mm Institute of Occupational Medicine (IOM) inhalable sampler, the 25-mm Button sampler, and the open-face 25-mm plastic cassette. Filters were analyzed with a portable X-ray fluorescence (XRF) analyzer and then were analyzed by traditional chemical methods. The 25-mm filters needed only a single XRF reading, while three readings were taken across the 37-mm filters. For lead, all five samplers gave good correlations ($r^2 > 0.80$) between the two analytical methods over the entire range of found mass, encompassing the OSHA action level and permissible exposure limit. The 25-mm filter samples exhibited a negative bias, and the results were adjusted accordingly. A similar bias was found for copper, but not for iron or zinc. However, correction did not greatly affect the overall percentage of samples where the XRF result was within 25% of the chemical analysis result. After correction, this criterion was met by 90% of the Button samples and 97% of the IOM samples. The 25-mm cassette results did not achieve the criterion even with correction. XRF analyses from the GSP sampler were within 25% of the chemical analysis for 93.5% of the samples using either the middle reading only or the average of all three readings, in both cases without correction. After removal of outliers, the calculated uncertainty was acceptable for the GSP sampler results, and for the corrected IOM and Button sampler results. The 37-mm cassette using the NIOSH algorithm had only 64.5% of XRF analyses within 25% of the chemical analysis, with a positive bias in line with other studies.

# Podium Session 103: Health Care Industries

*Papers 14–21*

## 14

**OCCUPATIONAL EXPOSURE TO DIMETHYL SULFIDE IN THE HEALTH CARE SETTING.** T. Fuller, Boston University Medical Center, Boston, MA; S. Bloom, Brigham and Women's Hospital, Boston, MA.

Dimethyl sulfoxide (DMSO) is a chemical vehicle used to deliver a large variety of pharmaceuticals, as well as for infusion of human cells in certain medical treatments. Three to 6% of the DMSO administered to a patient is usually metabolized to dimethyl sulfide (DMS). This odorous compound is exhaled from the patient and also exudes from the pores in the skin, leading to the perception by caregivers that they may be receiving a toxic exposure. Air sampling was performed at varying distances from patients receiving stem cell infusions in which DMSO was used as a cryopreservative and transport medium. A free-standing air cleaner equipped with a sorbent filter was present in each patient room sampled, which was part of the participating hospital's standard protocol. Samples were collected on charcoal tubes and analyzed by gas chromatography. The odor threshold for DMS vapors is approximately 1 ppb, and the odor in treatment rooms is often quite powerful, leading to symptoms such as nausea in some caregivers. DMS vapors at elevated concentrations can also cause skin and respiratory irritation, headaches, and vomiting. Results of measurements performed to this point indicate that, although exposure levels exceed the odor threshold, they are below the limits of detection for the method used (approximately 15 ppb) and thus below the American Conference of Governmental Industrial Hygienists' Threshold Limit Value of 10 ppm. Future work will include measurements in areas with nominal ventilation and without area vapor-absorbing devices.

## 15

**DEVELOPMENTS IN BLOODBORNE PATHOGENS SAFETY: AN OSHA UPDATE.** D. Williams, U.S. DOL/OSHA, Washington, DC.

In an age of growing national concern with biosafety, infectious diseases, patients' rights, and bioterrorism, it is imperative to keep abreast of new developments in OSHA's enforcement policies and interpretations of applicable standards. The performance oriented nature of OSHA's bloodborne pathogens standard (29 CFR 1910.1030) is such that it leads to consistent changes to existing OSHA policies. This presentation will provide an update on new industrial hygiene application of OSHA's bloodborne pathogens standard in health care as well as other industries. Enforcement statistics and recent interpretive guidance will be presented.

## 16

**DOES THE 2004 TLV FOR NATURAL RUBBER LATEX OFFER ADEQUATE PROTECTION TO HEALTH CARE WORKERS?** C. Hon, L. Bennett, Vancouver Coastal Health, Vancouver, BC, Canada; Q. Danyluk, Fraser Health, Vancouver, BC, Canada.

The 2004 TLV booklet lists a TWA of 0.001 mg/m$^3$ for natural rubber latex (NRL). However, research indicates that this level may not offer adequate protection for workers in the health care industry. Although the TLV is clearly indicated for the "inhalable" route, it must be noted that exposure to NRL in health care can occur through both the dermal route as well as the respiratory route. In health care, dermal exposure occurs predominantly through the use of latex gloves. With respect to airborne exposure, donning and removing gloves has been shown to release latex-carrying powder in the air. These two routes of exposure are worth mentioning since NRL is designated as a sensitizer. This means that a susceptible individual who has been exposed to NRL may experience an intense response upon subsequent exposure to NRL, even at low exposure concentrations. As such, having an exposure limit based solely on the inhalable route may not be practical for health care as exposure to NRL can also occur via the dermal route.

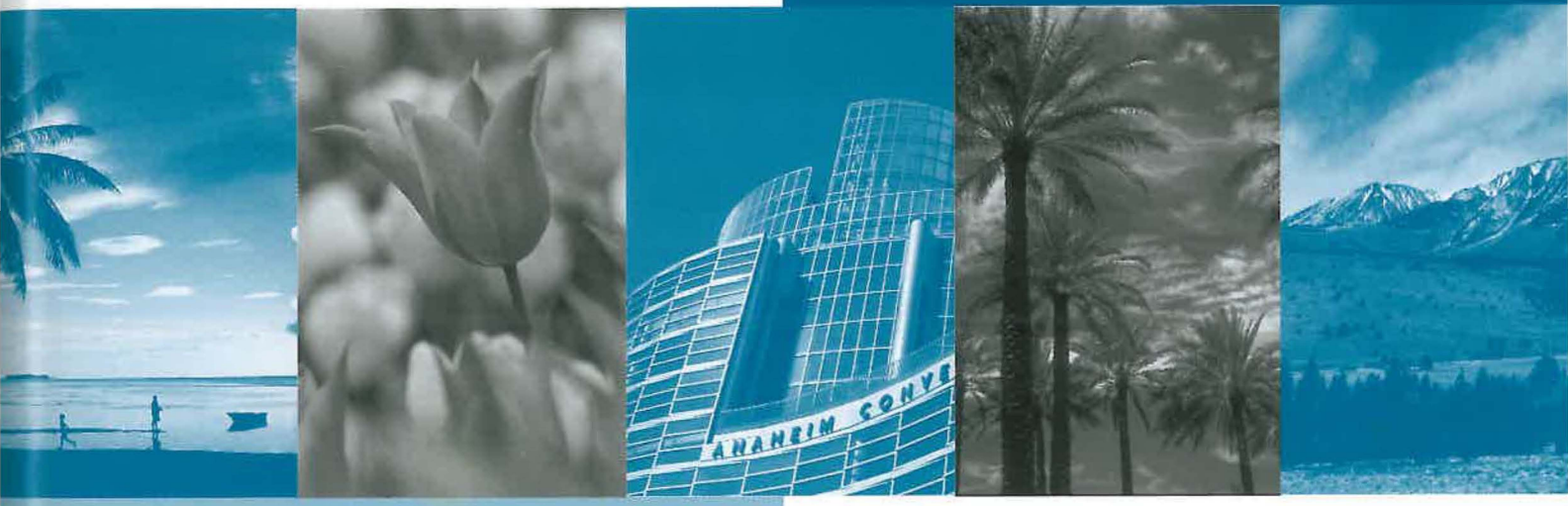
Currently, the amount of latex exposure needed to produce sensitization or an allergic reaction is still unknown. However, several studies have stated that exposure levels in the nanogram per cubic meter range are enough to trigger reactions. If NRL at the ng/m$^3$ level is known to produce signs and symptoms, clearly the exposure limit should reflect this concentration range.

Lastly, the TLV is also disconcerting because it was apparently based on a single study of workers in rubber glove manufacturing. This study did not consider exposures by both routes. In fact, the ACGIH implicitly states that the TLV "will not be protective for workers already sensitized, nor for those primarily exposed via skin contact?" Since skin contact is the primary exposure route within health care, the proposed exposure limit may not be appropriate.

# Abstract Book
# AIHce

**May 21–26, 2005**
**Anaheim, California**

## Celebrating Innovation




*Co-sponsored by AIHA and ACGIH®*

aihce

*The Premier Conference and Exposition for Occupational and Environmental Health and Safety Professionals*

www.aiha.org/aihce.htm