exposures from indoor environments. The major constraint is the miniscule quantities of mycotoxin present on a spore, mycelial fragment, or substratum particulate, which necessitates the collection of impractical amounts of air in samples in order to obtain sufficient quantities of mycotoxin for detection by conventional chemical methods. Bioassays including cell culture with porcine or feline cells and protein translation assays have been previously utilized. Here we describe the use of human lung cells (HFL-1), the primary target organ for indoor air exposures, for cytotoxicity screening. The assay was conducted, following with and without S9 microsomal activation, via testing for viability indicated by reduction of a tetrazolium compound in the presence of phenazine ethosufate. Comparisons made with porcine PK-15 cells showed that certain compounds had lower detection limits in the HFL-1 cells while others were more active against PK-15 cells. Macrocyclic trichothecenes and cytochalasins were most active without S9 activation, with lower detection limits ranging from approximately 5 to 1000 ng. Spores of a trichothecene-producing isolate of *Stachybotrys chartarum* from agar and rice cultures induced cytotoxicity in both cell lines at less than 500 cells per 100 microliter assay. Comparisons with a trichothecene-specific ELISA assay indicate that the levels of trichothecenes were below detection limits established for the cytotoxicity assay. This suggests that there are other cytotoxic or other factors affecting the cytoxicity assay. The humn lung cell cytotoxicity assay appears very sensitive and may prove valuable in helping assess the potential health effects from mold-contaminated indoor environments.

99.

AN EVALUATION OF WORK AREAS IN GOVERNMENT BUILDINGS WHERE WORKERS HANDLED AND OPENED IRRADIATED MAIL. R. Hall, J. Hess, B. Bernard, M. Kiefer, J. Harney, D. Mattorano, R. McCleery, L. Delaney, M. Gillen, K. Mead, A. Tepper, NIOSH, Cincinnati, OH.

The U.S. Postal Service (USPS) and government officials implemented irradiation procedures to protect against biohazards for mail destined to government offices in Washington, D.C. Shortly after this process was implemented, federal workers began reporting health symptoms they believed were related to irradiated mail. The National Institute for Occupational Safety and Health (NIOSH) received health hazard evaluation requests from USPS, the U.S. Office of Personnel Management (OPM), and the Sergeant at Arms of the U.S. Senate and the Chief Administrative Officer of the U.S. House of Representatives. The environmental evaluation portion of this investigation included air sample collection for contaminants potentially derived from heated mail as a result of irradiation. At the mail processing facility (where the mail is delivered after the irradiation process), area air samples collected for carbon monoxide (CO) in the middle of the delivery trailer and inside enclosed plastic bags that contained the irradiated mail indicated a potential for CO exposures. The mail processing facility implemented ventilation procedures to "air out" the mail and reduce possible hazards associated with CO. Environmental samples collected in the "V" Street postal facility, OPM building, and the evaluated Senate and House of Representative buildings where end users handle and open the mail, indicated contaminant concentrations well below applicable exposure criteria. In addition, exposures in irradiated mail locations were not demonstrably higher than exposures in control locations where there was no mail. Medical interviews identified individuals reporting symptoms of irritation while handling mail. The absorptive effect of the irradiated paper could account for some of the symptoms, other irritant symptoms may be due to odors associated with the mail, and still others due to sub-optimal humidity and heightened awareness. It is likely that a number of causes were responsible for symptoms.

100.

IDENTIFICATION AND ASSESSMENT OF WORKPLACE CONDITIONS CONTRIBUTING TO HIGHER EXPOSURE TO SOLVENTS IN THE PHARMACEUTICAL LAB USING THE VIDEO EXPOSURE ASSESSMENT SYSTEM. F. Xu, J. McGlothlin, Purdue University, West Lafayette, IN.

Solvents are widely used substances in the pharmaceutical labs, which cause toxicity to the nervous system, reproductive damage, liver and kidney damage, respiratory impairment, cancer, and dermatitis. Ventilation systems are commonly installed in the labs, and many experiments are operated in the hoods. Workplace events are thought of as the main factors that affect personal exposure levels. The main objectives of this study were to identify workplace conditions and personal behaviors that contributed to the fluctuation of exposure levels and excess exposure levels. The system of occupational video exposure monitoring was used including the combination technique of video and exposure data. Real-time data were gained by direct reading Photoionization Detector (PID), while the worker activities were captured in the same time. The analysis system of Multimedia Video Task Analysis (MVTA) synchronized real-time exposure data and the video recording work events. According to the location of personal activities, exposure data were grouped into three categories: operation inside the hood, random movements such as picking experiment materials from the storage stack, and operation outside the hood. Outside-hood operation is common in pharmaceutical labs since hoods can't always provide enough space for some experiments that take relatively large space. The personal exposure level for the inside-hood operation was found to be significantly less than that for the outside-hood operation ($p<0.05$). It was also found it was significantly less than that for random movements ($p<0.05$). Activities that were categorized as random movements happened before the outside-the-hood experiment began or far away from it. Staying close to hoods is recommended fo
tion from
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training fo
also recommended to reduce exposure levels.

101.

**OCCUPATIONAL EXPOSURE TO MERC
TECH
AMAL**
Stepher
Utah, S

This study investigates occupational exposure to mercury vapor during the use of improved dental techniques to prepare amalgams. Mercury, which vaporizes at room temperature, acts as a binding agent in the preparation of dental amalgams used in tooth fillings. Past amalgam preparation techniques enabled elemental mercury to be spilled on counters, floors, equipment, and in trashcans, exposing dental health care professionals to mercury vapors. In an effort to reduce these occupational exposures, a revised technique using disposable pre-encapsulated amalgam capsules has been developed. Preliminary findings presented in published scientific literature suggest that use of the pre-encapsulated amalgam capsule does decrease the amount of mercury vapor exposure received by dental health professionals, but does not offer adequate protection against adverse levels of exposure. This study presents data documenting the degree to which occupational exposure to mercury vapor is reduced using the improved amalgam preparation technique in a Salt Lake City dental office. This presentation evaluates occupational exposure to mercury vapors by the collection of 8-hr breathing zone samples during workdays when dental amalgam preparation is being performed. In an effort to further characterize the occupational exposure, air sampling data using real-time mercury analyzers is presented. Assessment of occupational exposure to mercury vapors is performed by comparing all sample concentrations to OSHA PELs and ACGIH TLVs. Also, to provide applied information regarding the measurement of mercury vapors, obtained air sampling results using the integrated and real-time monitoring methods are statistically compared and any correlations investigated.

102.

LATEX ALLERGEN RESERVOIRS IN TWO HOSPITAL BUILDINGS. C. Rao, D. Weissman, G. Kullman, J. Cox-Ganser, NIOSH, Morgantown, WV.

An investigation was conducted in two hospital buildings that provide tertiary healthcare services for North-central Montana. Although

powdered latex glove use was being phased out, there were concerns over potential reservoirs and airborne exposures of latex allergen. We evaluated latex allergen concentrations in air and in settled dusts collected from floors, chairs, and ventilation systems.

Air sampling and ventilation dust microvacuum sampling were conducted using 2-micrometer pore size, 37-millimeter (mm) polytetrafluoroethylene (PTFE) filters in open-faced cassettes. Air sampling time was during the hours of 7 a.m. to 7 p.m. for four days. Floor and chair dusts were collected onto 142-mm diameter glass fiber filters with a commercial vacuum. The filters and dusts were analyzed for latex allergen using a competitive inhibition immunoassay.

Latex concentrations in air were below the limit of detection for the method (LOD = 0.16 ng latex allergen/m^3). Hospital B had significantly higher concentrations of latex allergen in ventilation system dust than Hospital A. Latex concentrations in ventilation system dust ranged from <LOD to 376 ng/mg of dust. Sixty-two percent of the ventilation dust samples were below the limit of detection (21/34). Latex concentrations in the floor and chair dust ranged from 0.05 to 108 ng/m^2 in the floor and 0.35 to 274 ng/chair in the chair samples. The overall geometric means across all floor and chair sampling sites were 1.26 ng/m^2 and 24.1 ng/chair, respectively.

Although the air samples were negative, there were reservoirs of latex allergens in the hospitals. To protect sensitized individuals, it would be prudent to properly clean these areas to lower the potential for re-aerosolization and occupant exposures.

103.

CARBON MONOXIDE EMISSIONS AND EXPOSURES ON RECREATIONAL BOATS UNDER VARIOUS OPERATING CONDITIONS. G. Earnest, A. Echt, J. McCammon, K. Dunn, R. McCleery, D. Hammond, L. Blade, NIOSH, Cincinnati, OH.

National Institute for Occupational Safety ınd Health (NIOSH) researchers evaluated car-ɔon monoxide (CO) exposures on over twenty ecreational boats in the U.S. Most of the evalu-ıted boats were speed boats or cabin cruisers anging in age from new to 25 years old. These ɔats had gasoline-powered, propulsion engines nd the evaluated cabin cruisers used gasoline-owered generators to provide electricity. IIOSH researchers are aware of 106 nation-ide CO poisonings associated with recreation-boats (non-houseboats) over approximately ıe past decade. This study was performed for e U.S. Coast Guard to better understand how O poisonings occur on recreational boats and identify the most hazardous conditions. Boats ere evaluated while stationary and at three to /e speeds ranging from 2.5 to 25 miles per ur. Carbon monoxide concentrations were easured using multiple real-time instruments different locations on the boats and at various stances behind the boat while moving. Study results indicated that stationary conditions were generally the most hazardous; however, many boats had fairly high CO concentrations near the rear deck while moving. Most of the evaluated boats generated hazardous CO concentrations (with peak CO concentrations commonly exceeding 1000 ppm and average CO concentrations well over 100 ppm on the boats' rear decks). Two boats, one using a 150-hp Evinrude Ficht engine and the other using a 40-hp Johnson engine, had dramatically lower CO concentrations than any of the other evaluated boats having peak and average CO concentrations an order of magnitude lower than most other boats. These two new engines utilized recently developed technologies to burn cleaner and comply with recent EPA regulations. Elimination of uncontrolled gasoline-powered marine engines and more wide-spread use of cleaner burning drive engines and generators would help to reduce but not eliminate the CO poisonings seen on recreational boats.

104.

CHARACTERISATION OF AMBIENT ETHYLENE-OXIDE AND HYDROGEN CHLORIDE EXPOSURE. C. Barnard, C. Weyers, Technikon Free State, Bloemfontein, South Africa.

Data available on low-level chronic exposure to gases present in the ambient air of welding workshops are limited. This is especially true with regard to South African welding conditions. A study was conducted to determine the ambient gas exposure (ethylene-oxide (C_2H_4O) and hydrogen chloride (HCl)) of welders in a large engineering plant in Bloemfontein, South Africa. The aim of the study was the characterisation of gas exposure during summer and winter months, for the determination of possible health risks after chronic low-level exposure.

Gases were sampled by means of a direct reading instrument namely, the Process Monitoring System (PMS-64). The system was placed at a stationary sample base in the centre of the workshop. Data were collected during one week of each month, extending from February (summer) to July (winter). The data were retrieved from the system, processed, and calculated into eight-hour TWA concentrations.

The concentrations found in the welding shop were compared to the environmental Threshold Limit Values® (TLVs®) or occupational TLVs® recommended by global authoritative organisations. In the absence of such specific TLVs®, an environmental TLV®, calculated as one fortieth of the occupational TLV, was used. High C_2H_4O concentrations were found in the welding shop as a result of the oxy-ethylene welding process. Previous research concluded that C_2H_4O, at levels found in this study, could possibly be a powerful mutagen, neurotoxin, and potential carcinogen. Consistent low-level concentrations of HCl were detected, which caused welders to be chronically exposed. This could cause chronic irritation of the upper respiratory tract and eyes.

It is concluded that the welders exposed to the ambient air in the workshop could experience some health problems after chronic exposure. The results emphasise the importance of exposure characterisation studies in order to identify pollutants and to implement engineering control of emission sources.

105.

CADMIUM EXPOSURE DURING REFURBISHING OF GAS METER FERRULES AND THE SUBSEQUENT ACTIONS TO ELIMINATE OVER-EXPOSURE AND REDUCE SURFACE CADMIUM. S. Vogl, P. Hand, L. Schumann, Clayton Group Services Inc., Edison, NJ; J. Raspa, New Jersey Natural Gas, Wall, NJ.

In December 2001, OSHA released the Hazard Information Bulletin (HIB)—*Potential Hazards Associated with the Refurbishing of Gas Meters* outlining potential elevated cadmium exposures during wire brushing of gas meter ferrules. In response to the HIB, NJ Natural Gas (NJNG) performed personal and area air sampling for cadmium during wire brushing. Results indicate employee exposures ranged from 1.5 to 36 µg/m^3. Area concentrations ranged from 0.5 to 1.3 µg/m^3. The OSHA PEL for cadmium is 5 µg/m^3. Surface sampling of floors, horizontal surfaces, elevated surfaces, ventilation systems, and office spaces showed surface concentrations were <10 to 23,000 µg/ft^2. Bulk dust samples showed cadmium content ranging from 1400 to 4000 ppm.

Procedures to eliminate over-exposures and reduce surface cadmium were necessary. These response actions were needed promptly and had to be addressed while minimizing the impact to site activities and services.

A site-wide cleanup was undertaken. Cleanup techniques included the use of "negative pressure enclosures," HEPA filter equipped vacuuming, and wet-wiping. Cleanup occurred while the site remained mostly active. Airborne cadmium concentrations during and after cleanup ranged from <0.221 to <0.353 µg/m^3. Surface concentrations following cleanup ranged from 0.325 to 293 µg/ft^2.

Wire brushing operations have stopped. Employees were notified of sampling results and the hazards of cadmium via a company-wide meeting. Employees were also provided with biological monitoring. Biological monitoring yielded normal results. NJNG worked with meter vendors to prevent future purchases of meters with cadmium-containing ferrules. Non-brushing techniques, including whole ferrule replacement and whole meter-top replacement, are now used in place of wire brushing.

Task procedure changes and ultimate cadmium elimination will reduce employee exposure. Cleanup was successfully conducted while minimizing the impact to the site's ability to provide utility support services.

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