Abstracts

Health Care Industries
Papers 1-6

1

Re-Aerosolization of Microorganisms from the Filter Media of Health Care Respirators. Y. Qian, J. Donnelly, V. Ulevicius, K. Willeke, University of Cincinnati, Cincinnati, OH

Health care respirators are used to protect health care workers and patients against airborne microorganisms such as *Mycobacterium tuberculosis*. While the respirator wearer inhales, microorganisms present in the air environment may deposit on the respirator's filter material. These captured microorganisms may become a secondary contamination source under adverse conditions such as coughing or sneezing. The purpose of this study was to investigate the re-aerosolization of captured microorganisms from the filter media of health care respirators. Different filter media of health care respirators were cut into 40 mm disks in diameter and were tested as typical filtration velocities of 0.6 m/s and higher in the direction opposite to the loading flowrate. Also, a high velocity jet was used to re-aerolosize these microorganisms and inert spherical test particles from the filter media to see whether under extremely adverse condition a sizable fraction of the deposited organisms may be re-aerosolized. The measurement for particles loading and re-aerosolization were conducted with Aerosizer, a real-time particle size spectrometer. The results indicate that at air velocities below 1 m/s only a very small percentage of the microorganisms re-aerosolized from the filter media (less than 0.01%). The jet flow results in higher re-aerosolization, up to 0.5%. Re-aerosolization increases with increasing particle size. Based on the results obtained so far, it can be concluded that re-aerosolization of microorganisms appears to be a minor problem under normal breathing conditions. The further testing of a diversity of filter materials may modify this initial conclusion.

2

Respiratory Protection Selection and Acceptance by Health Care Workers for Protection Against Airborne Tuberculosis Droplet Nuclei in a Major Health Care Center. L. Schaefer, E. Bernacki, R. Gilpin, The Johns Hopkins Institutions, Baltimore, MD

When the Centers for Disease Control issued its Draft Tuberculosis Guideline in 1994, it stated that respiratory protection was required for workers who must enter isolation areas. Occupational Safety and Health Administration enforcement document further stated that at that time only high efficiency particulate air (HEPA) respirators met this requirement. Based upon these documents, the Johns Hopkins Medical Institution conducted evaluation of several of the available half face respirators to determine their potential for use in the Institution. A pilot program was then initiated to determine the acceptance of the selected respirators, any problems with training programs, problems the staff may experience with respirators, and patients' acceptance of the respirators. Based on the outcome of the pilot, a final selection and cost analysis was conducted. Evaluation included staff and patient acceptance, compliance cost, training, and American with Disabilities Act (ADA) issues. The final selections were presented to the Medical Institution's administration for acceptance and use throughout the Institution. A continuous project to monitor compliance and to address concerns of health care workers, patients, and visitors was established.

3

Total Latex Management: Identifying, Assessing, and Controlling Exposures to Latex Allergens in the Health Care Environment. N. Moss, K. Coghlan, J. McCarthy, Newton, MA

Latex allergy has become a major occupational health concern in the health care industry. Reports in the international literature indicate that between 8% and 17% of health care workers are at risk for latex reactions. Traditional exposure minimization programs have focused on replacing high allergen, powdered gloves with low allergen, powderless gloves to reduce dermal and inhalation exposures. A study was conducted in a large teaching hospital (>700 beds) to identify other secondary and tertiary exposures to latex allergen within the hospital environment. Environmental dust samples were collected for analysis using a radioimmunoassay technique to determine latex allergen content. Air samples were collected on Teflon filters for RAST analysis to assess the impact of a variety of activities (i.e., operations and maintenance, renovation) on airborne levels of latex allergen.

Significant reservoirs of latex allergen were identified in environmental dust samples collected within the hospital. Levels ranged from 1000 ng/g to 1,000,000 ng/g of latex allergen in the dust. These levels are comparable to moderately high latex allergen containing glove products. When these areas were disturbed during renovation activities, airborne levels of ND to 50 ng/m³ were measured. These levels have been associated with reactions in sensitive individuals.

These environmental levels of latex allergen have accumulated due to use of high latex allergen content gloves and other products over a long period of time. When disturbed, this dust may exceed levels associated with reactions in highly latex sensitive individuals. The data collected in this study suggest that other important secondary and tertiary exposures to latex allergen may exist in health care institutions that have used high latex products in the past. Appropriate identification, assessment, and control of these allergen reservoirs is required to fully control environmental latex exposures to health care personnel.

4

Nitrous Oxide Exposure Controls for Cervix Cryo Therapy. C. Warholic, J. Blakley, R. Cravener, C. Thomas, Duke University Medical Center, Durham, NC

Nitrous oxide has been linked with spontaneous abortion, congenital abnormalities, and liver, kidney, and nervous system disorders among health care workers who have been chronically exposed at high levels. Within the hospital setting, this gas is most commonly utilized of its anesthetic properties. However, it has recently been gaining popularity as a cryogenic agent. Most industrial hygiene efforts have focused on nitrous oxide exposures during its use as an anesthetic. Consequently, very little monitoring data is available for such cryogenic procedures. Given increasing concern about the hazards associated with nitrous oxide, a study was initiated to investigate employee exposure levels during one such procedure commonly known as cervix cryo therapy. During this procedure, a "cryo device" is used to freeze mild dysplasia (pre-malignant tissue) on the surface of the cervix. The necrosed tissue eventually sloughs off thus reducing the likelihood of the development of cervical cancer. Hospital employees participating in this procedure were interviewed and exposure monitoring was conducted. Landauer Nitrox LT dosimetry devices were used to determine employee exposure levels. Initial results revealed that exposures were consistently higher than the ACGIH 8-hr TWA of 50 ppm. During this 11-minute procedure, levels as high as 10,431 ppm were observed. Engineering control methods were developed with the objective of scavenging the gas while completely isolating it from the breathable environment. Through subsequent exposure monitoring, it was determined that the control measures utilized were effective in reducing exposure levels to below the ACGIH TLV, and in some instances to below detection limits.

It has been concluded that nitrous oxide must be scavenged during this procedure to prevent overexposures from occurring. Several types of engineering controls can be utilized to bring exposure levels to below detectable limits. Control measures can be utilized without decreasing the effectiveness of this procedure.

5

Nitrous Oxide Exposure to Operating Room Personnel Using Different Mask Induction Techniques During Pediatric Ear Surgery. E. Stewart, Kaiser Permanente, Oakland, CA

Epidemiological, clinical and/or experimental evidence over the past 25 years indicated that nitrous oxide can injure the hematopoietic system, fetus, brain, lung, liver, and kidneys of occupationally exposed individuals. Perceptual, cognitive, and eye-hand coordination effects have been seen in volunteers exposed to levels as low as 50 ppm. Little published real-time data exists that correlates anesthesia providers' work practices with occupational exposure to operating room staff.

This study looks at those anesthesia induction techniques most likely to produce fugitive emissions from anesthesia machines equipped with waste gas scavenging. Changes in work practices can have significant effects on the exposure to operating room staff. The work practices and resulting exposures of 27 anesthesiologists and 11 nurse anesthetists were examined over the course of 145 pediatric ear surgeries (all bilateral myringotomies) in 18 hospitals and ambulatory surgery centers.

Real-time data was gathered with a datalogger from an infrared analyzer whose probe was placed to represent the anesthesia provider's exposure. Exposure results were verified with passive diffusion dosimeters hung from the infrared probe top. Time weighted average exposures were calculated based on the period of administration for each bilateral myringotomy, starting from patient entry into the operating room and ending when the patient left the room for recovery. Anesthesia induction techniques and work practices were noted as they affected short-term exposures.

This study correlates mask induction techniques with short-term time weighted average nitrous oxide exposures and shows that careful work practices during mask inductions can reduce occupational exposures to all operating room personnel to below recommended exposure limits.

6

Occupational Health Concerns in the Denture Industry. R. Korczynski, Manitoba Labour, Winnipeg, Manitoba, Canada

Concerns were raised by several denturists regarding potential exposure to methyl methacrylate, dust and noise in the processing of dentures. Both the National and Provincial Denturist Associations encouraged testing to be conducted. The ACGIH TLV-TWA for particulates not otherwise classified (PNOC) is 10 mg/m³ inhalable particulate and 3 mg/m³ respirable particulate. Analyses were according to NIOSH Methods 0500 and 0600. In Manitoba, a hearing conservation program is required where the equivalent sound pressure level (Leq) exceeds 80 dBA-weighted sounds pressure level (dBA) on an averaged 8-hr day. Quest model M-8B dosimeter was used. Methyl methacrylate was analyzed according to NIOSH Method 2537. Results were: respirable dust exposure was below the lower detection limit (LDL) of 0.3 mg/filter (N=5) and inhalable dust exposures ranged from 0.91 to 1.29 mg/m³ (N=5, SD±0.14). Ambient dust concentrations ranged from 71-79 dBA (AM=75). Personal exposures to methyl methacrylate ranged from 7.14 to 7.35 mg/m³ (N=5, SD±.07) and ambient concentrations ranged from