Abstract 12

Workplace Exposures and Health Outcomes of South Los Angeles Haircare Professionals in Black Hair Salons

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Objectives: 1. To determine specific occupational health and safety exposures faced by workers in Black hair salons; 2. To determine occupational health outcomes faced by workers from salon hazards; 3. To determine the prevalence of personal protective equipment (PPE) and ventilation use in salons.

Methods: 63 salon workers in South Los Angeles were invited to participate in the Healthy Hair Initiative Project survey. The survey questions were designed to assess physical, ergonomic and chemical workplace exposures encountered in salons. The questions included years in the industry, past workplace health and safety training, services provided, haircare products used, frequency of PPE use, ventilation use, and health symptoms and conditions experienced while working. Surveys were collected from salon workers (n=22) and were analyzed using statistical methods. The data collected was used to create a safety training program.

Results: Analysis of the survey responses collected showed that while 54% of hair care professionals had over 12 years of experience in the field, fewer than 39% of workers had received any health and safety training on workplace hazards. Analysis of reported health outcomes showed that 65% of workers experienced fatigue, 56% experienced pain in wrists and fingers, and 48% experienced leg or foot problems. In addition reports of physician diagnosed asthma, carpal tunnel, and reproductive health disorders were documented. PPE use varied, with protective aprons being the most used and face masks being used the least.

Conclusions: The group surveyed had a wide array of health concerns that may be attributed to work in the salon setting. Implementation of a health and safety training program for hair professionals may limit the exposures and health outcomes faced by salon workers. These results help us to target future work including training programs, policy recommendations, and advocacy efforts on behalf of salon workers.

Abstract 13

Permeation of Limonene through Disposable Nitrile Gloves Using A Dynamic and Static Robotic Hand

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Objectives: To compare the permeation of pure limonene as a low volatile solvent through different disposable nitrile gloves (blue, purple, sterling, and lavender from Kimberly Clark Professional) in a dynamic and static robotic hand as a whole glove permeation model.

Methods: A Yeager robotic hand was assembled to provide a 20-second clench cycle. A circulating water system using Viton tubing connected to a peristaltic pump was used to transfer water at 35°C from the glove to the sampling point. Experiments were in triplicate. Aliquots of 1 mL were taken at permeation time intervals of 1.0, 10, 20, 40, 60, and 80 min, 2.0, 4.0, 6.0, and 8.0 h., and deposited into 1.5-mL vials. The analytical method was based on capillary column gas chromatography-mass spectrometry with temperature programing and the internal standard method (4-bromophenol). The pre and post-permeation glove thicknesses were measured by a digital micrometer.

Results: The average thicknesses after permeation for all specific glove types were greater than 10% of the original ones ($P \leq 0.05$). The average permeation rate for the lavender gloves for the moving robotic hand (0.490 ± 0.031 μg/cm^2/min) was higher than for the non-moving hand ($P \leq 0.05$),unlike for the other gloves. The average standardized breakthrough times at 0.1 μg/cm^2/min for the moving and static hands were not different ($P \leq 0.05$). These times increased with glove thickness.

Conclusions: None of the gloves passed the Kimberly Clark Professional permeation breakthrough time criteria or the Ansell criteria. They should not be used as PPE for exposure to limonene, even for very short exposure periods. Nitrile blue gloves may be safe for short exposures of less than 20 minutes.

Abstract 14

Black Carbon and Ultrafine Particle Infiltration through HVAC System

C. Wong, C.C. Fung, and Y. Zhu, Department of Environmental Health Sciences, Fielding School of Public Health, University of California, Los Angeles, 650 Charles E. Young Drive South, 51-295B CHS, LA, USA.

Objective: To identify the correlation of diesel exhaust and indoor air pollutants. Complaints of diesel exhaust odor within office spaces at the Fielding School of Public Health raised suspicion of infiltration through ventilation system, since diesel exhaust can cause premature mortality and increased cancer risk prompting administrative concern and scientific investigation. This 7 story, 2 basement building has roughly 1,800 occupants comprised of academic and administrative staff, and students.

Methods: DustTraks, SMPS, Q-Trak, and Aethalometer measured simultaneously the indoor and outdoor air concentrations of $PM_{2.5}$, ultrafine particles, carbon dioxide, and black carbon, respectively. Instruments placed inside offices measured indoor air concentrations. Instruments placed through a sealed window of the second floor office that faces the loading dock measured outdoor air concentrations. Twenty-four hour sampling was done from January 10–18, 2014. Time series of data and linear regression of outdoor and indoor concentrations were graphed.

Results: Results indicate consistent infiltration of diesel exhaust due to diesel truck traffic in the loading dock where the HVAC is located. Spikes in indoor air pollutant concentrations are observed throughout the day that correspond to outdoor air pollutant concentration. Outdoor air concentrations and indoor air concentrations have similar trends. R-squared analysis of black carbon reached up to 0.63, $PM_{2.5}$ peaked at 0.62, ultrafine particles was up to 0.93, and carbon dioxide's highest r-square was 0.86. Differences in correlation is explained by chemical and physical properties of ultrafine particles, $PM_{2.5}$, black carbon, and carbon dioxide. Peaks in concentrations occurred during the

presence of loading trucks and that the longer the trucks were in the loading dock, the higher the concentrations were.

Conclusion: Administrative mitigation through stringent enforcement of vehicles emission standards allowed in the loading dock or controls implemented to change times that freight trucks are loading. Engineering controls include increasing ventilation and installing filters with higher MERV scores.

Abstract 15

Integrating a Toxicological Approach for Mixtures in the Estimation of Respirator Cartridge Service Life

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Objective: It is a complex task to estimate cartridge service life (CSL) for mixtures of contaminants. OSHA-CPL-02-00-158 recommends the use of the additive principle where CSL is determined from the sum up of the concentration of the components in the mixture to the most volatile contaminant breakthrough time (BT). This may lead to premature change schedules and unnecessary costs. This study aims to integrate a toxicological approach in estimating CSL.

Method: Simulations using the IAST-Langmuir model combined with the modified Wheeler-Jonas equation allowed the prediction of adsorption capacities and breakthrough curves. Acetone was used as an example of a volatile organic contaminant with m-xylene, styrene, and toluene. Simulations of exposures to acetone (10-700 ppm) and the other contaminant of lower volatility (500 ppm) through a respiratory cartridge with 50 g of carbon at 25°C and a flow rate of 24 L/min were performed. Outlet concentrations were used to determine the Hazard Index (HI) throughout the exposure. The HI is defined as the sum of concentrations for each mixture component normalized by its threshold limit value (TLV) (value >1 indicates a health risk). The CSL estimations based on the 10% BT of acetone and the 10% of HI for the mixture were compared.

Results: Simulations of BT curves were in agreement with experimental data previously published. At lower acetone concentrations (<50 ppm), the simulated CSL using 10% HI of the vapor mixture were up to two times greater, than the 10% BT approach. At higher concentrations of acetone, both approaches gave similar results.

Conclusions: The HI approach is a useful tool to characterize the risk related to exposures to mixtures of contaminants. Its use in combination with BT prediction models can assure a safe use of respirator and optimize estimation CSL. To complete the analysis, the type of respirator (full or half-facepiece) should be considered.

Abstract 16

Evaluating Occupational Exposure Hazards on a Rural Active Farm

G. Godsey, C. Lungu, S. Baker, C. Cholewa, and B. Marsh, University of Alabama at Birmingham (UAB), Birmingham, AL; J. Ketzler, M. Sarratt, A. Sherman, and X. Zhang, Auburn University, Auburn, AL.

Objective(s): Alabama has over 48,500 farms covering over nine million acres, approximately 27% of Alabama's land mass. Agriculture creates 580,295 jobs in Alabama generating $70.4 billion making it the state's largest industry. With farming being such a large part of Alabama, a team of students from UAB and Auburn consisting of students in industrial hygiene, occupational nursing, and ergonomics examined potential risk factors present in farming. Risk factors examined were noise due to tractors, ergonomic risks in chicken farming, and hazards from doors slamming in chicken houses due to pressure changes.

Methods: The noise levels were obtained using a sound pressure level meter to measure levels at 20ft and 1ft from tractor, along with samples from inside the cab to determine the noise reduction that occurs. The ergonomic risks of picking up the deceased chicken (approximately 400/day) were determine using the NIOSH Lifting Calculator. A vaneometer was used to determine the velocity the door slammed, which was used to determine the force exerted on the door.

Results: The results of the noise sampling showed that a new tractor can produce noise levels of 90dB at 20ft, 95dB at 1ft, and 70dB in the cab. A tractor from 1992 can produce noise levels of 100dB at 20ft, 105dB at 1ft, and 83dB in the cab. The NIOSH Lifting Calculator yielded a lifting index of 2.70. The vaneometer showed that the amount of force exerted on the door was 54.4lbs.

Conclusions: Proper hearing protection should be utilized by people operating older tractors, tractors without cabs, and people standing near the tractors. There is a need for engineering or administrative controls to be implemented for the task of collecting the deceased chickens. The doors need to be equipped with dampers to stop the slamming.

Abstract 17

Assessing Potential Diesel Exhaust Exposure in Truckers Resting at Truck Stops

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Objectives: 1.To assess the concentration of diesel particulates inside and outside of the truck by gravimetric analysis 2. To take real time measurements of $PM_{2.5}$ inside and outside of the truck 3.To identify and evaluate covariates influencing levels of diesel particulates and $PM_{2.5}$, inside and outside of the truck 4. To ascertain an association between inside and outside concentration of diesel particulates and $PM_{2.5}$.

Methods: A diesel powered truck with a sleeper cab was parked at a truck stop for 10-hour sampling periods with the engine running. Two personal pumps were used simultaneously to collect area samples of diesel particulates from inside and outside of the truck for quantitative analysis using the NOISH 5040 method. Two TSI DustTrak™ aerosol monitors were used

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