

watering of roadways during the mining operation. Employee education on health effects of dust exposure, work practices, maintenance of equipment and PPE, medical surveillance, chest X-rays and TB awareness and monitoring are essential in the elimination of silicosis.

964 **PASSIVE MONITORING OF CHEMICAL EXPOSURES IN SOUTH FLORIDA FIREFIGHTERS USING SILICONE WRISTBANDS**

¹Katerina M Santiago*, ¹Alberto J Caban-Martinez, ¹Jeremy Baum, ¹Johnathan Pangborn, ²Emre Dikici, ¹Natasha Shaefer Solle, ³David A Sterling, ¹Kevin Moore, ¹Kathy Grace, ²Sylvia Daunert, ²Sapna Deo, ¹Erin N Kobetz. ¹Department of Public Health Sciences, University of Miami, Miller School of Medicine, Miami, FL, USA; ²Department of Biochemistry and Molecular Biology, University of Miami, Miller School of Medicine, Miami, FL, USA; ³School of Public Health, University of North Texas Health Science Centre, Fort Worth, TX

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Introduction Firefighters are likely to be exposed to many toxic chemicals in the performance of their work duties such as polycyclic aromatic hydrocarbons (PAHs). Chemical exposures may occur through dermal, oral, or inhalation pathways. Passive sampling devices are used to sequester organic molecules through passive diffusion and provide time-weighted averages of chemical concentrations. This pilot study uses silicone-based wristbands as a personal passive sampler to detect known carcinogens during a 24 hour work shift.

Methods Twenty-four wristbands were deployed across various fire services throughout South Florida. Prior to deployment, bands were cleaned using a standardised cleaning protocol to remove contamination and optimise the surface for absorption. Wristbands were then packaged in air-tight bags to prevent contamination. Wristbands were worn on fire service personnel and collected at the end of a 24 hour work shift. Chemical contaminants were then extracted from the wristband and analysed for PAHs—identified using the EPA IRIS, California Proposition 65, and IRAC datasets—using gas chromatography-mass spectrometry.

Results The average number of chemicals found across all wristbands (n=24) was 23 with 4 categorised as carcinogenic to humans (i.e., Benzo[b]fluoranthene, Benzo[j]fluoranthene, Chrysene, and Naphthalene). All bands had at least one PAH present, specifically, 87.5% contained Benzo[b]fluoranthene (mean=5.23 ng/band), 50% contained Benzo[j]fluoranthene (mean=2.05 ng/band), 79.2% contained Chrysene (mean=9.55 ng/band), and 100% contained Naphthalene (mean=176.53 ng/band). Actual types of exposure compounds is likely to be larger than the observed data as the group of PAHs detected was limited to three existing datasets.

Discussion Silicone-based wristbands are feasible to use within the fire service to detect and characterise ambient hazardous chemical compounds. These personal self-samplers used during a 24 hour collection period identified various PAHs in the firefighter work environment. Objective measures of harmful chemical exposures in the fire service should be monitored with a comprehensive surveillance system that includes personal sampler devices.

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EVALUATING TEMPERATURE CHANGES AND VOLATILE ORGANIC COMPOUND OFF-GASSING IN TURNOUT PROTECTIVE GEAR ENSEMBLES AMONG FLORIDA FIREFIGHTERS

¹Katerina M Santiago*, ¹Alberto J Caban-Martinez, ¹Jeremy Baum, ¹Johnathan Pangborn, ²Emre Dikici, ¹Natasha Shaefer Solle, ¹David Sterling, ¹Tualy Koru-Sengul, ¹Kevin Moore, ¹Isabelle Salvaterra, ²Sylvia Daunert, ²Sapna Deo, ¹Erin N Kobetz. ¹Department of Public Health Sciences, University of Miami, Miller School of Medicine, Miami, FL, USA; ²Department of Biochemistry and Molecular Biology, University of Miami, Miller School of Medicine, Miami, FL, USA

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Introduction Firefighter protective gear ensembles have been shown in controlled laboratory and staged live fire training experiments, to collect and harbour carcinogens such as polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). Protective gear is often time transported in the personal vehicle of firefighters, resulting in cross-contamination between the vehicle and the fire incident environment. In the Southern United States particularly, ambient warmer temperatures may influence the rate of VOC gear off-gassing. This pilot study characterises temperature and particle off-gassing of firefighter turnout gear immediately following a 24 hour work shift.

Methods Twelve sets of gear were obtained from South Florida career firefighters. Their protective gear, including helmet, gloves, hood, pants, boots and turnout coat, were placed in a large vacuum sealed Pelican case immediately after a 24 hour work shift. Turn-out gear was randomly selected at each fire station regardless of fire exposure. A photoionization gas detector (0.2 to 200 ppm), MetOne particle counter, Chromosorb diffusion patch, and a temperature logger were placed in each case with the ensemble for a 24 hour collection period.

Results In two extreme observation points, VOC off-gassing was moderately, but significantly, correlated with temperature changes within the exposed gear (case#1: $r=0.50$; $p<0.001$) while a low correlation was observed in case#2 ($r=0.06$; $p=0.01$). Fine particulate matter (1–10 μm) was documented at least up to 1 hour after the gear was placed in most cases. Smaller size (0.3–0.5 μm) particulate matter was present up to 5 hours after placement across several cases.

Discussion Firefighter turnout gear used during real-life fire incident response events was documented to release VOCs and particles immediately after a 24 hour work shift. These results suggest the importance of the development of robust decontamination procedures immediately following a fire incident response is needed to reduce exposure to potential carcinogens from firefighter protective gear.

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MODIFICATION AND IMPROVEMENT OF FIT TEST METHOD USING AMBIENT AEROSOLS

¹SH Yang, ¹SH Huang, ²YM Kuo, ¹KJ Yang, ³CY Lai, ¹CC Chen*. ¹National Taiwan University, Taipei, Taiwan; ²Chung Hwa University of Medical Technology, Tainan, Taiwan; ³Chung Shan Medical University, Taichung, Taiwan

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Introduction Fit testing should be performed before the use of tight-fitting respirators. However, it may not always be