SR-401-05

Silica Exposure During Core Processing in Mining Exploration

S. Kalenge, Occupational Cancer Research Centre, Cancer Care Ontario (CCO), Toronto, ON, Canada; V. Arrandale, Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada

Objective: Although, there is extensive research on occupational exposure in active (production phase) mines, there is limited information on the occupational exposure of workers during the exploration phase of mining. The aim of this study was to assess personal exposure to airborne particulates and crystalline silica in a core processing facility that was part of a mining exploration project in Northern Ontario, Canada.

Methods: Personal air samples were collected on pre-weighed 37mm PVC filters (5 µ) with 3-piece open-face cassettes attached to SKC aluminum cyclones. All samples were analyzed for respirable particulates using gravimetric analysis (NIOSH Method 0500) as well as respirable crystalline silica using Fourier Transform Infra-red spectroscopy (FT-IR) (NIOSH Method 7602). Time weighted average concentrations were calculated for respirable particulate, respirable quartz and respirable cristobalite/tridymite.

Results: Sixteen personal air samples were analyzed. Full shift respirable particulate exposure ranged from 0.069 to 2.24 mg m^{-3} with a geometric mean (GM) of 0.28 mg m^{-3} and a geometric standard deviation of 2.76. The Ontario exposure limit for respirable particulate is 3 mg m^{-3}. Respirable particulate concentrations were significantly higher among workers in the core cutting area compared to the core logging area (GM 0.43 mg m^{-3} vs. 0.088 mg m^{-3}; p=0.02). No samples had detectible levels of cristobalite / tridymite. Full shift quartz exposure ranged from 3.3 to 55.4 µg m^{-3} with a geometric mean (GM) of 6.53 µg m^{-3} and a geometric standard deviation of 2.67. The Ontario exposure limit for respirable quartz is 100 µg m^{-3}. Quartz concentrations were higher among workers in the core cutting and core sorting areas, as compared to those in the core logging area. No pairwise differences reached statistical significance.

Conclusions: Workers employed in core processing facilities as part of mining exploration activities are exposed to respirable particulates and silica. Although no individual measurements exceeded the Ontario occupational exposure limits, some personal exposures approached the limits among workers who were performing core cutting tasks. Exposure to respirable particulates and silica in mining exploration should be monitored as exposure controls may be needed.

SR-401-06

High Flow Rate Thoracic Size Selective Samplers

T. Lee and M. Harper, NIOSH, Morgantown, WV

Objective: To calibrate high flow rate thoracic size selective samplers (GK4.126 and FSP10), which can be used for dual fraction size selective sampling to measure the respirable and thoracic size fractions.

Methods: Six different sizes of monodisperse ammonium fluorescein aerosols were generated using a vibrating orifice aerosol generator. Airborne particles were collected with samplers in a cylindrical calm air test chamber. After sampling, the fluorescent intensity was measured using a luminescence spectrometer. Because the size interval of the Aerodynamic Particle Sizer for particles > 8 µm is large (> 0.6 µm), projected area diameters of the monodisperse ammonium fluorescein particles were measured with a field emission scanning electron microscopy. At least 100 particles of projected area diameters were measured for each particle size. Equivalent volume diameter was calculated using average project area diameters. From equivalent volume diameter, an aerodynamic diameter was calculated with the particle's specific gravity and dynamic shape factor. Three repetitions with each sampler units were conducted at each size of particle size. The measured performance data for the cyclone was assessed against the thoracic target convention defined in American Conference of Governmental Industrial Hygienists (ACGIH®)/Comité Européen de Normalisation (CEN)/ International Standards Organization (ISO).

Results: The measured cut off diameters (d_{50}s) for the GK2.69, GK4.126 and FSP10 cyclones were 9.7, 9.8, and 10.9 µm, respectively. Bias maps for the cyclones were generated from the measured sampling efficiency compared to the ACGIH/ CEN/ISO thoracic convention for a range of mass median aerodynamic diameter 1-30 µm with geometric standard deviation of 1.5-4. The GK2.69 cyclone was tested at a flow rate of 1.6 l min^{-1} as a reference sampler for comparison and its performance was similar to that observed in a previous study. The estimated biases for the measured experimental GK2.69 cyclone performance compared with ACGIH®/CEN/ISO thoracic convention were negative up to 25 % while those of the GK4.126 and FSP10 cyclones were positive up to 7 and 11 %, respectively.

Conclusions: High flow rate cyclones normally used for respirable size selective sampling were calibrated to measure the thoracic size fraction. The recommended flow rates of GK4.126 and FSP10 cyclones for thoracic size selective sampling are 3.5 and 4.0 l min^{-1}, respectively. Higher flow rate samplers will collect more sample for subsequent analysis resulting in an increase in sensitivity making them more useful for the measurement of low concentration aerosols or during short term or task specific sampling. The cyclones should be further investigated for sampling of specific occupational aerosols.

SR-401-07

Evaluation of Bioaerosol Properties and Antibiotic Resistance in Animal Hospital

C. Lai, M. Wang, and C. Chan, Department of Occupational Safety & Health, Chung Shan Medical University, Taichung, Taiwan; W. Lee, Veterinary Medical Teaching Hospital of National Chung-Hsing University, Taichung, Taiwan; A. Kuo, Chung Shan Medical University Hospital, Taichung, Taiwan

Objective: Biological pollution deeply impacts health of human beings and bioaerosols can result in infection or allergy. Under different animal host (including human) and interaction of different environments, microorganisms may have a resistance to antibiotics. In this study, we sampled in animal hospitals in order to investigate microorganism species, concentration and resistance to antibiotics of bioaerosols at different temperatures, and evaluate their hazards to human health.

Methods: In this study, three types of bioaerosol samplers

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