Respiratory Tract Model was used to calculate the mass of indium remaining in the alveolar compartment after accounting for initial deposition, particle characteristics, and mechanical and dissolution clearances. Relationships between exposure indices and health outcomes were evaluated using generalized linear mixed models with subject as a random factor and adjusted for smoking status and age. Models were compared using a ratio of the regression coefficient to its standard error, a measure of precision, and the Akaike Information Criterion (AIC), a relative measure of model fit.

Results The alveolar dose metric correlated well with cumulative exposure ($r_{sp} = 0.876$) and plasma indium ($r_{sp} = 0.726$). All three exposure indices were associated with respiratory symptoms, lung function, and serum biomarkers, but alveolar dose identified additional significant or borderline significant associations not present for cumulative or plasma indium. Alveolar dose often had the highest precision for the effect estimate and lowest AIC.

Conclusion The alveolar dose metric performed better than cumulative exposure and plasma indium despite the high correlation, demonstrating that dose-based metrics can improve exposure-response modeling.

0-317 CURRENT RESPIRABLE CONCENTRATIONS OF QUARTZ ACROSS OCCUPATIONS IN DENMARK

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Introduction High airborne concentrations of respirable quartz have been reported from workers in construction, foundries, and quarries. Current exposure levels in prevalent but presumably lower exposed jobs have been less examined.

Objectives To quantify the current exposure concentrations of respirable dust and quartz across prevalent occupations with expected moderate to high levels of exposure in Denmark. A second aim was to identify determinants of respirable quartz exposure across occupations.

Methods 189 full-shift personal samples of respirable dust within 11 occupations were sampled and analysed for quartz content with infrared spectrometry. Determinants for respirable quartz like use of tool and location of worksite were analysed in mixed linear effect models.

Results The overall geometric means (geometric standard deviation) for respirable dust and quartz were 220 $\mu\text{g}/\text{m}^3$ (4.19) and 16 $\mu\text{g}/\text{m}^3$ (4.07), respectively. The highest quartz concentrations were observed among stone cutters and carvers (93 $\mu\text{g}/\text{m}^3$ (3.47)), and metal melters and casters (61 $\mu\text{g}/\text{m}^3$ (1.71)). Use of power tools increased exposure concentrations by a factor of 3.5. Of the total variance, variability between jobs explained 27%, variability between companies within jobs explained 29%, and variability between workers within a job within a company explained 14%. 30% of the total variance was explained by day-to-day variability.

Conclusion A number of jobs in this study had average exposure levels to respirable quartz above 50 $\mu\text{g}/\text{m}^3$. Use of power tools were the main determinant. Preventive measures to lower excess risk of lung cancer among these workers are still needed.

0-462 ASSESSMENT OF OVEREXPOSURE TO MULTIPLE METALS IN ELECTRONIC RECYCLING FACILITIES: USING AIR SAMPLES AND BIOMARKERS TO HIGHLIGHT POTENTIAL TOXICITY

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Objective To estimate potential toxicity risks associated with exposure to several metals in electronic waste recycling (e-recycling) facilities in Quebec.

Methods In a cross-sectional study, personal air samples were collected on cellulose ester filters from six e-recycling facilities, during an 8-hour work day for 85 workers (66 men, 19 women). Twelve metals were analyzed by inductively coupled plasma mass spectrometry (ICP-MS). End-of-shift blood and urine spot samples were taken; blood cadmium and urinary arsenic were also analyzed by ICP-MS, and blood lead and urinary mercury by atomic absorption spectrometry. Additive hazard indices (HIs) were calculated for organ-specific toxic effects, by adding the ratios of measured concentrations of metals in air or biological fluids, on the threshold limit value (TLV[®]) or on the biological exposure indices (BEI[®]).

Results All facilities provided workers with some personal protective equipment, with inconsistent wearing of respiratory equipment. They all conducted manual dismantling, and three performed shredding of electronic/plastic residues. Cadmium, copper and lead were found in the highest concentrations in the air, albeit all below the TLVs. Air concentrations of lead showed a strong association with biological levels, indicating an occupational exposure origin. HIs calculated with the biological measures revealed an exceedance of the mixture's threshold limit for lung toxicity (arsenic, cadmium, cobalt, nickel and chrome) in 95% of the workers, as well as an exceedance for skin irritation (arsenic, mercury, cobalt, nickel) in 19% of them. HIs exceeded the unity as well in some workers for gastrointestinal, peripheral nervous system, and reproductive function toxicity.

Conclusions

Multi-exposures complicate risk assessment Although individual metals all respected the TLVs, the calculation of hazard indices from both air samples and biomarkers highlighted potentially increased risks of toxicity for several organs or systems in e-recycling workers.

Heat and Climate Change

0-127 HEAT-RELATED ACUTE KIDNEY INJURY IN INDOOR AND OUTDOOR WORKERS IN THE U.S.

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Introduction Heat-related acute kidney injury (HR-AKI) may increase workers' risk of chronic kidney disease. Occupational HR-AKI has been reported in agriculture and a few other sectors, but there has been no comprehensive study of HR-AKI across indoor and outdoor industries.