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Metal concentrations in urine samples of welder apprentices

Abstract *

Exposure to welding fumes may result in serious adverse health effects such as occupational asthma and chronic obstructive pulmonary disease (COPD). Determination of metal concentrations in urine samples has been used as a tool to estimate exposure to metals. Mn exposure is a concern since Mn levels in welding fumes often exceed the occupational exposure limit (OEL) for Mn. In this study, urinary metals were quantified in groups of controls and welder apprentices in a longitudinal analysis during their first year of training. Air samples were concurrently collected to determine exposure.

Fasting urine samples as well as air samples were collected from age- and sex-matched controls (unexposed to welding fumes) and welders on days 0, 1, 7 and 50 of an 8-week welding program. Air samples were digested in an Ultrawave system using a nitric/fluoroboric acid solution. Urine samples were diluted in a nitric acid/ EDTA solution for metal analysis. All analyses were carried out using inductively coupled plasma mass spectrometry in the SWAMP Lab, University of Alberta.

RM-ANOVA showed no differences between controls and welders for metals in urine, including Mn, while air samples showed a significant increase in exposure between days 0 and 50 for welders. However, independent t-test analysis showed a small increase in Cr between day 0 and 50 in welders.

We conclude that urinary metals, in particular Mn, are not reliable for determine exposure to welding fumes in welder apprentices. Future work will include an analysis of professional welders and pre- to post-shift comparison.

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