

## CA27: Discrimination of oxidative stress risk in chrome-plating workers using multivariate modeling

Rezvan Zendeheel<sup>1,2\*</sup>, Mansour R. Azari<sup>1</sup>, Vajihe Hosseini<sup>1</sup>

**Objective:** The evidence demonstrates that oxidative stress is the main cause for hexavalent chromium-induced damage. In this study, Oxidative stress as a toxicity of hexavalent chromium in chrome electroplating workers was investigated using the multivariate modeling approach. The main goal of this analysis is the possibility of categorizing the chrome electroplating workers based on oxidative stress parameters as predictor variables.

**Method:** Blood samples were collected from 30 chrome electroplating workers employed in the profession for at least 1 year. Controls were sex and age-matched and had the same social status with no history of hexavalent chromium exposure. We assessed blood chromium levels and biochemical changes in the plasma by analyzing biomarkers of oxidative stress, namely, Ferric-reducing ability of plasma (FRAP) thiol content and Lipid peroxidation. Data of exposed employee were subjected to principle component analysis (PCA) and artificial neuronal network (ANN) to obtain oxidative stress pattern for chrome electroplating workers.

**Results:** Blood chromium levels increased from 4.42 µg/L to 10.6 µg/L. In this range of exposure, induction of oxidative stress was observed by increased in Lipid peroxidation (22.38±10.47 vs 14.74±4.82 (µM), P <0.0008), decreased plasma antioxidant capacity (3.17±1.35 vs 7.74±4.45 µM, P <0.0001) and plasma SH groups (0.21±0.07 vs 0.45±0.41 (µM), P <0.0042) in comparison to controls. Principal components analysis discriminated two groups that their oxidative stress is correlated. The workers with higher blood chromium concentration than 5.97 µg/L are among the group at risk of oxidative stress induction and employee with blood chromium concentration ≤ 5.97 µg/L are probably in risk of oxidative stress creation. ANN methods can predict oxidative-risk category for assessment of toxicity induction in Chrome electroplaters.

**Discussion:** The results showed multivariate modeling can be interpreted as the induced biochemical toxicity in the workers exposed to hexavalent chromium. Different occupation groups were assessed on the risk level of oxidative stress which could further justify proceeding engineering control measures.

**Key words:** Oxidative stress, chrome electroplaters, Principle component analysis, Artificial neuronal network.

<sup>1</sup> Department of Occupational Hygiene, School of Public Health, Shaheed Beheshti University of Medical Sciences Tehran, Iran

<sup>2</sup> Occupational Hygiene Laboratory, Deputy Chancellor of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran Zendeheel76@yahoo.com.