The Evaluation of Occupational Exposure of Chrome in Welders of Stainless Steels

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Abstract : Introduction: Stainless steel is resistant to electrochemical corrosion by passivation. Welders are greatly exposed to welding fumes of toxic metals, which added to this steel. The content of chromium (Cr) in steel was above 11.5%, Ni and Mo from 2 to 6.5%. The aim of the study was the evaluation of occupational exposure to Cr, chromosome analysis and valuation of individual susceptibility polymorphism of gene CCND1 c.870 G>A. Materials and Methods: The exposed group was consisted from 117 welders of stainless steels. The average age was 38.43 years and average exposure time 7.14 years. Smokers represented 40.17%. The control group consisted of 123 non-exposed workers with an average age of 39.74 years and time employment 16.67 years. Smokers accounted for 22.76%. Analysis of Cr in blood and urine was performed by atomic absorption spectrophotometry (AAS Varian SpectraAA 30P) with electrothermal decomposition of the sample in the graphite furnace. For the evaluation of chromosomal aberrations (CA) was used cytogenetic analysis of peripheral blood lymphocytes, gene polymorphism was determined by PCR-RFLP reaction using appropriate primers and restriction enzymes. For statistical analysis was used the Mann-Whitney U-test. Results: The mean Cr level in exposed group was 0.095 mmol/l (0.019 min-max 0.504). No value does exceed the average normal value. The average value Cr in urine was 7.9 mmol/mol creatinine (min 0.026 to max 19.26). The total number of CA was 1.86% in compared to 1.70% controls. (CTA-type 0.90% vs 0.80% and CSA-type 0.96% vs 0.90%). In the number of total CA was observed statistical difference between smokers and non-smokers of exposed group (S-1.57% vs. NS-2.04%, $P<0.05$). In CCND1 gene polymorphisms was observed the increasing of the total CA with wild-type allele (WT) via heterozygous to the VAR genotype (1.44%<1.82%<2.13%). There was observed a statistically higher incidence of CTA-type aberrations in variant genotypes between exposed and control groups (1.22% vs. 0.59%, $P<0.05$). Discussion and conclusions: The work place is usually higher source of exposure to harmful factors. Workers need consistently and checked frequently health control. In assessing the risk of adverse effects of metals is important to consider their persistence, behavior and bioavailability. Prolonged exposure to carcinogens may not manifest symptoms of poisoning, but delayed effects may occur, which resulted in a higher incidence of malignant tumors.

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