Individual susceptibility to hexavalent chromium of workers of shoe, hide, and leather industries. Immunological pattern of HLA-B8,DR3-positive subjects

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Abstract: Background. This study was designed to examine the effects of hexavalent chromium [Cr(VI)] on the immunological pattern of shoe, hide, and leather industry workers, moving from the hypothesis that some haplotypes (HLA-B8,DR3) can be important hidden risk cofactors.

Methods. Workplaces of 20 firms were monitored for total and respirable dusts and for total and hexavalent chromium. Cr(VI) on materials was also measured. Assay of chromium levels in blood and urine of 44 serological human leukocytes antigen (HLA)-typed workers (20 exposed, 15 HLA-B 8,DR3-negative/5-positive and 24 non-exposed, 18 HLA-B8,DR3-negative/6-positive subjects) was performed by atomic absorption, and lymphocyte subsets (FACS-analysis), mitogen-mediate lympho-proliferation ([H-3]thymidine incorporation), cytokine levels (ELISA), natural killer (NK) cytotoxic activity (Cr-51-release assay) were determined.

Results. The environmental parameter levels are lower than threshold limit value-time-weighted average (TLV-TWA); in the materials, the Cr(VI) values exceeded the levels allowed. The peripheral blood mononuclear cells (PBMC) proliferation and the T-helper1 (TH1) cytokine pattern of subjects chronically exposed were significantly raised; addition in vitro of Cr(VI) further stimulated these parameters and in general the entire TH1 system and NK activity. The TH2 system was unaltered. In the HLA-B8,DR3-positive workers, immunologically "low responders", the addition of Cr(VI) in vitro caused a further reduction of the considered parameters in the exposed subjects with a dramatic deficit of the TH1 system.

Conclusions. Results indicate the unsuitability of TLV-TWA as a line of demarcation between safe and dangerous Cr(VI) concentrations and the importance of individual genetic susceptibility for occupational and preventative medicine. In particular, the presence of the HLA-138,DR3 alleles can represent an important cofactor of immunotoxic susceptibility consequent to chronic low-dose Cr(VI) exposure.