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Effect of hexavalent chromium on hematological parameters in chrome plating workers

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Abstract
The present work was aimed to find out the toxic Chromium which is widely used in the chrome plating. In this study, 220 chrome plating workers from Lahore industrial areas with age ranging from 20 to 35 were selected for the assessment of health risks. A control group of 110 individuals from the same age without chromium exposure ware also selected. A total of 220 chrome plating workers with age ranging 20-35, were included. Hexavalent chromium was significantly higher among all the workers as compared to controls. White blood cells (WBCs), red blood cells (RBCs), haemoglobin (Hb), mean corpuscular hemoglobin (MCH), and *packed cell volume* (PCV) were significantly (p<0.001) lower in exposed groups I and II than control.

Keywords: Chrome plating, white blood cells, red blood cells, hexavalent chromium, hemoglobin

1. Introduction
Chrome plating workers are exposed to many physical and chemical hazards. Chrome plating includes many processes with different exposures, which can be hazardous for the health of the workers [1]. Chromium may enter the body by breathing or through direct skin contact; therefore, workers are taking mainly in Cr (VI) form exposed to this element [2]. As chromium is an irritant, it can cause perforations in the nasal septum, respiratory problems, dermatitis, gastrointestinal, hepatic and renal impairments [3-4]. Several toxic effects are associated with exposure to hexavalent chromium compounds, including increased incidence of certain cancers, toxic towards living cells, tissue and organisms [5-6]. The aim of the research work was to find out the effect of hexavalent chromium on hematological parameters in chrome plating workers, Khyber pakhtunkhwa, Pakistan.

2. Materials and Methods
In this study of 220electroplating workers from the Lahore industrial area, Punjab province, Pakistan with age ranging from 20 to 35 were selected for the assessment of health risks. Hexavalent chromium was determined by graphite furnace atomic absorption spectrophotometer Perkin Elmer model 700 (Perkin Elmer, CA, USA). Hematological parameters were determined at the department of Biochemistry, Fatima Jinnah medical college, Lahore by using the Sysmex model KX-21 automated hematology analyzer.

3. Results
About 220 individuals were included in this study along with the prior consent. All the individuals were grouped into different age groups ranging from 20 to 50 years old. All the workers were exposed to hexavalent chromium, which is considered a major health hazard. The levels of hexavalent chromium in erythrocytes of the exposed and control groups are shown in table 1. Chrome workers in group I (aged 20-35, 1-10 years exposure) and group II (aged 36-50, 11-20 years exposure) showed significantly higher blood Cr levels than that of controls. Chrome plating workers in age group II were more effected and showed higher chromium concentration as compared to group I and control. From the results it is clear that no definite pattern has been observed in different hematological parameters. The difference observed in various parameters was mostly insignificant. White blood cells (WBCs), red blood cells (RBCs), hemoglobin (Hb), mean corpuscular hemoglobin (MCH), and packed cell

volume (PCV) was significant ($p<0.001$) lower in exposed groups I and II than control (Table 1). Electroplating workers in group II with longer duration of chromium exposure were most affected and showed lower WBCs, RBCs, Hb, MCH, PCV levels than that of group I and unexposed population. This showed that the duration of exposure has a significant effect on hematological parameters of workers.

Table 1: Hematological Parameters in blood of electroplating workers exposed to lead

	20-35 years			36-50 years		
	Controls	**Workers (exposed group I)**	**t-statistic**	**Controls**	**Workers (exposed group II)**	**t-statistic**
Cr (VI) µg/l	0.673±0.043	3.92±0.25	8.45*	0.685±0.08	4.14±0.23	7.31*
WBC x103/µl	9.60±0.96	8.543±0.91	6.19*	9.22±1.03	8.373±0.747	5.16*
RBC x106/µl	5.17±0.27	4.46±0.31	13.24*	5.061±0.32	4.12±0.530	11.72*
ESR mm/hr	7.56±1.59	7.25±1.17	1.24	8.15±1.85	7.90±1.51	0.82
Hemoglobin (g/dl)	14.48±0.71	10.409±0.733	30.78*	14.25±1.00	10.02±1.14	21.64*
MCH (pg)	28.61±1.45	26.38±1.48	8.35*	28.02±1.44	25.91±1.50	7.86*
MCHC (g/dl)	29.09±1.55	28.62±2.74	1.15	29.35±1.52	28.89±2.32	1.28
PCV %	44.57±1.35	43.24±1.60	4.96*	45.07±1.23	42.62±2.00	8.08*
MCV (fl)	85.08±1.35	82.24±1.73	10.03*	85.74±1.35	81.87±1.52	14.79*
Pltx103/µl	260.58±1.99	259.91±3.28	1.35	252.65±3.91	251.90±4.47	0.98

**Values are significant at $p<0.001$*n = 220

5. Discussion

Hexavalent chromium compound is a strong oxidizing agent and can lead to health hazards. In chrome plating, workers are occupationally exposed to hexavalent chromium, which has shown toxic effect on health. The decrease in RBCs and WBCs levels in chrome plating workers may be due to the chromium induced erythrocyte damage or reduction in red cell glutathione leading to increase free radical which causes cell death [7-8]. It has been reported that reduction in hemoglobin level might be due to the effect of toxic pollutants on hematopoietic system which may cause an anemic condition in human [9]. It has been documented that low WBC count has been associated with severe neutropenia [10]. In addition, microcytic and hypochromic anemia has been observed by a decrease in concentration in MCH, hemoglobin and RBC count. With the protection of gloves, apron and boots, the respiratory system is the main way through which hexavalent chromium was absorbed into the body. Therefore, chromium compounds may be the main source of metal exposure for chrome plating workers and the major contributor to hematological defects.

6. Conclusion

Our data demonstrated the fact that occupational exposure to hexavalent chromium induces hematological defects in chrome plating workers. The workers should be encouraged to follow the health protection procedures and strictly observe workplace safety rules to minimize the toxic effect of hexavalent chromium.

7. References

1. Stern FB. Mortality among chrome leather tannery workers: An update. Am J Ind Med. 2003; 44:197-206.
2. Issever H, Ozdilli K, Ozyildirim BA, Hapcioglu B, Ince N, Ince H *et al*. Respiratory problems in tannery workers in Istanbul. Indoor Built Environ. 2007; 16:177-83.
3. Kornhauser C, Katarzyna W, Kazimierz W, Malacara JM, Laura EN, Gomez L *et al*. Possible adverse effect of chromium in occupational exposure of tannery workers. Industrial Health. 2002; 40:207-13.
4. Stern RM, Berlin A, Fletcher A. International conference on health hazards and biological effects of welding fumes and gases: Copenhagen 18-21, February, 1985. Int Arch Occup Environ Health. 1986; 57:237-46.
5. Angerer J, Amin W, Heinnrich-Ramm R. Occupational chronic exposure to metals. Arch Occupational Environ Health. 1987; 59:503-12.
6. Lin SC, Tai CC. Nasal septum lesion caused by chromium among chromium electroplating workers. Am J Ind Med. 1994; 26:221-8.
7. Basketter D, Horev L, Slodovnik D, Merimes S, Trattner A, Ingber A. Investigation of the threshold for allergic reactivity to chromium. Contact Dermatitis. 2001; 44:70-4.
8. Ateeq M, Fawad A. Lipid Peroxidation and Biochemical Abnormalities in Tannery Workers exposed to Hexavalent Chromium. RJB, 2016; 11(7):75-82.
9. Ateeq M, Khurshid R, Khan I, Shaheen A. Effect of Heavy Metals from Tannery Effluent on the Soil and Groundwater using Multivariate Analysis in District Sheikhupura, Pakistan. Res. J Chem. Environ. 2015; 19(1):48-55.
10. Ateeq M, Zareen S, Rehman HU. Occupational allergic contact dermatitis in tannery workers: an underestimated health issue. JEZS. 2016; 4(5):310-312.