

Title

Unexpected associations of long-term and excessive exposure to trivalent chromium with hypertension and glycosuria in male tannery workers

Key points

1. Chronic Cr(III) exposure in tannery workers (TWs) was estimated by toenail Cr level
2. Cr level in non-tannery workers (n-TWs) was similar to that in the general population
3. Mean Cr level in TWs with a high Cr level was >500-fold higher than that in n-TWs
4. Prevalences of hypertension and glycosuria were decreased in TWs with a high Cr level
5. Unexpected effects of exposure to a high level of Cr(III) on health were presented

Summary

The leather industry is a huge industry with a global trade value of over 100 billion US dollars and with several million workers are engaged worldwide. Since trivalent chromium [Cr(III)] is extensively used in tanneries worldwide, environmental pollution becomes a concern in and around tanneries when wastewater from tanneries is discharged without being adequately treated. We have not only reported on the concerns of the environmental pollution in a built-up area of tanneries in Bangladesh but has also developed a novel remediation system that is effective in mitigating pollution (Chemosphere 2018; Chemosphere 2022a).

In this study, we investigated the effect of long-term excessive exposure to Cr(III) on the association to the prevalence of hypertension and the prevalence of glycosuria. Contrary to the initial expectations, the results showed that the prevalence of hypertension and the prevalence of glycosuria were significantly decreased in tannery workers with a high Cr

level compared to those in non-tannery workers. These findings suggested that metabolic disorders including hypertension and glycosuria may be prevented and improved by Cr(III). On the other hand, previous studies revealed that Cr(III) improved diabetes by affecting insulin sensitivity. Taken together, the results of this research demonstrated for the first time that long-term excessive exposure to Cr(III) could decrease the prevalence of hypertension and the prevalence of glycosuria in tannery workers without a particular disease such as diabetes.

Although present study have demonstrated a beneficial effect of Cr(III), we also found skin disorders (Chemosphere 2019), renal damage (Environ Res 2020), and hearing loss (Chemosphere 2022b) induced in tannery workers who were long-term and excessively exposed to Cr(III). Since Cr(III) is considered relatively safe element, which is used as a dietary supplement all over the world, further research is necessary to carefully examine what kind of effects of Cr(III) has on what kind of organs when exposed at what doses as well as by what route.

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