

Measurement of DNA-protein cross-links in human leukocytes following acute ingestion of chromium in drinking water

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Increased DNA-protein cross-linking (DPX) in circulating leukocytes has been proposed as a potential biomarker for exposure and genotoxic damage caused by inhalation of certain reactive chemicals, such as hexavalent chromium [Cr(VI)]. This study was designed to determine whether ingestion of a single dose of potassium dichromate alone [Cr(VI)] or potassium dichromate fully reduced to Cr(III) with orange juice (prior to ingestion) causes an increase in DPX of circulating leukocytes in humans. Four adult male volunteers ingested a bolus dose of 5000 µg chromium in a 0.5 l volume of water (10 p.p.m.), and blood samples were collected at 0, 60, 120, 180 and 240 min afterwards for analysis of DPX formation in circulating leukocytes. Results were compared to each person's own background concentration of DPX in leukocytes. Blood and urine samples were also collected for up to 2 weeks following the dose to examine the pattern of uptake and excretion of chromium. The results showed that there was no significant change in DPX observed following either Cr(VI) or Cr(III) ingestion, even though blood and urine chromium measurements indicated systemic uptake of a substantial fraction of the ingested chromium. Since Cr(III) does not possess DPX-inducing properties while Cr(VI) does, these results suggest that the Cr(VI) was reduced to Cr(III) intragastrically prior to absorption or that the amount of Cr(VI) absorbed into the blood was insufficient to produce DPX. These results are consistent with prior research that indicated that DPX would not occur following exposure to Cr(VI) except at very high doses.