

## **HUMAN HEALTH RISK AND EXPOSURE ASSESSMENT OF CHROMIUM (VI) IN TAP WATER**

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*Hexavalent chromium [Cr(VI)] has been detected in groundwater across the United States due to industrial and military operations, including plating, painting, cooling-tower water, and chromate production. Because inhalation of Cr(VI) can cause lung cancer in some persons exposed to a sufficient airborne concentration, questions have been raised about the possible hazards associated with exposure to Cr(VI) in tap water via ingestion, inhalation, and dermal contact. Although ingested Cr(VI) is generally known to be converted to Cr(III) in the stomach following ingestion, prior to the mid-1980s a quantitative analysis of the reduction capacity of the human stomach had not been conducted. Thus, risk assessments of the human health hazard posed by contaminated drinking water contained some degree of uncertainty. This article presents the results of nine studies, including seven dose reconstruction or simulation studies involving human volunteers, that quantitatively characterize the absorbed dose of Cr(VI) following contact with tap water via all routes of exposure. The methodology used here illustrates an approach that permits one to understand, within a very narrow range, the possible intake of Cr(VI) and the associated health risks for situations where little is known about historical concentrations of Cr(VI). Using red blood cell uptake and sequestration of chromium as an in vivo metric of Cr(VI) absorption, the primary conclusions of these studies were that: (1) oral exposure to concentrations of Cr(VI) in water up to 10 mg/L (ppm) does not overwhelm the reductive capacity of the stomach and blood, (2) the inhaled dose of Cr(VI) associated with showering at concentrations up to 10 mg/L is so small as to pose a de minimis cancer hazard, and (3) dermal exposures to Cr(VI) in water at concentrations as high as 22 mg/L do not overwhelm the reductive capacity of the skin or blood. Because Cr(VI) in water appears yellow at approximately 1–2 mg/L, the studies represent conditions beyond the worst-case scenario*