

Estimation of a Chromium Inhalation Reference Concentration Using the Benchmark Dose Method: A Case Study

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The benchmark dose (BD) method has been proposed as an alternative to the NOAEL/UF method for setting reference levels. The BD is the 95% lower confidence limit on a dose corresponding to a 10% increase (or relative change) in an adverse effect. A case study exploring the suitability of the current Cr(III) and Cr(VI) inhalation toxicity data bases to the BD approach is presented. Because chromic acid mists, typical of many occupational Cr(VI) exposures, present a toxicological profile different from that of Cr(VI) particulates, representative of environmental exposures, Cr(VI) particulate data were evaluated separately from Cr(VI) acidic mist data. The current Cr(III) and Cr(VI) acidic mist data bases proved inadequate for BD analysis due to data and/or study quality limitations. Benchmark reference concentrations (RfCs) for particulate Cr(VI) ranging from 0.34 $\mu\text{g}/\text{m}^3$ (for lactate dehydrogenase (LDH) in bronchoalveolar lavage fluid (BALF)) to 1.4 $\mu\text{g}/\text{m}^3$ (for increased lung weights) are derived from data taken from U. Glaser *et al.* (*Arch. Toxicol.* 57, 250-256, 1985) and U. Glaser *et al.* (*Environmental Hygiene II*, Springer-Verlag, Berlin/New York, 1990). A Cr(VI) particulate RfC of 0.34 $\mu\text{g}/\text{m}^3$ based upon LDH in BALF as the critical effect is proposed. This value may be viewed as conservative since it represents the 95% lower confidence limit on the dose associated with a 10% increase in response for a sensitive endpoint and has appropriate dosimetric adjustments and uncertainty factors incorporated.