

Brief Communication

Chromium (VI) at Plausible Drinking Water Concentrations Is Not Genotoxic in the In Vivo Bone Marrow Micronucleus or Liver Unscheduled DNA Synthesis Assays

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INTRODUCTION

Chromium is an essential trace element involved in lipid and glucose metabolism. In industrial applications, it is frequently used as an anticorrosive in cooling systems, boilers, and oil drilling systems. Human exposure is generally to the trivalent [Cr(III)] and hexavalent [Cr(VI)] forms. Cases have been reported of humans exposed to Cr(VI) generally at levels up to a few ppm in contaminated well water [Neri et al., 1980; Zhang and Li, 1987; Wang et al., 1990; Armienta-Hernandez et al., 1995].

Cr(VI) has been reported to be genotoxic in several in vitro test systems [De Flora et al., 1990; International Agency for Research on Cancer (IARC), 1990]. These positive findings in bacterial and mammalian cell test systems are not surprising, because intracellular reductants of Cr(VI) are known to react with cellular macromolecules, including DNA, and Cr(VI) is actively transported into cells via sulfate anion channels.

Data related to the in vivo genotoxicity of Cr(VI) in laboratory animals is limited. Chorvatovičová et al. [1991, 1993] reported induction of micronuclei in bone marrow of male Wistar rats, male guinea pigs, and female ICR mice. These studies administered Cr(VI) as multiple intraperitoneal injections, thereby bypassing the gastrointestinal tract. No other reports of in vivo genotoxicity testing of Cr(VI) have appeared in the literature.

The purpose of this study was to determine the potential in vivo genotoxicity of Cr(VI) in drinking water at concentrations ranging from the relevant human exposure level of 1 mg/liter to the upper limit of palatability in rodents (20 mg/liter) [MacKenzie et al., 1958]. The mouse bone marrow micronucleus and in vivo-in vitro rat hepatocyte unscheduled DNA synthesis (UDS) assay were used to evaluate the in vivo genotoxicity of Cr(VI).