

Health Effects of Hexavalent Chromium

A fact sheet by
CalEPA's Office of Environmental Health Hazard Assessment
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What is hexavalent chromium?

Hexavalent chromium, also known as chromium 6 (Cr6), is the toxic form of the metal chromium. While some less toxic forms of chromium occur naturally in the environment (soil, rocks, dust, plants, and animals), Cr6 is mainly produced by industrial processes.

Cr6 is used in:

- Electroplating
- Stainless steel production and welding
- Pigments and dyes
- Surface coatings
- Leather tanning

How are people exposed to Cr6?

Humans are exposed to Cr6 by:

- Inhalation of aerosols or particles
- Ingestion (eating and drinking)
- Skin contact

Cr6 may occur as aerosols or particulate matter in air. These can be inhaled directly or ingested after they land on soil or water. Contact with soil containing Cr6 may transfer to the hands and then to the mouth. Young children put their hands in their mouths more frequently than adults. For this reason, young children are more likely to consume contaminated soil. Children are also more active outdoors and they may have more contact with contaminated soil.

One form of Cr6, chromic acid, is created as a mist during electroplating. Workers and bystanders may inhale the mist. Chromic acid can also be absorbed through the skin. In addition, chromic acid deposited on the skin can be ingested through hand-to-mouth activities, such as eating.

What are the health effects from breathing Cr6?

Inhalation of Cr6 can cause cancer and non-cancer health effects.

Cancer effects: Breathing Cr6 over a long period of time increases the risk of lung cancer and nasal cancers

Non-cancer effects: Breathing Cr6 at high levels over time can cause or worsen certain health conditions, including:

- Irritation of the nose, throat and lungs (runny nose, coughing)
- Allergic symptoms (wheezing, shortness of breath)
- Nasal sores and perforation of the membrane separating the nostrils (at very high air levels in workplaces)

What are the health effects from eating, drinking, or touching Cr6?

Eating or drinking Cr6 may also be harmful to humans. Studies show that Cr6 in drinking water may cause an increased risk of stomach cancer and reproductive harm. Direct contact with Cr6 can cause allergic skin rashes in some people.

At what level could health effects occur?

OEHHA has calculated a cancer risk associated with exposure to Cr6 if that exposure continues for an entire lifetime. Continual exposure to 0.045 nanograms per cubic meter (ng/m^3) of Cr6 from all sources combined for 30 years could increase cancer risk to 25 in a million. Exposure over shorter periods of time would be associated with much lower cancer risks.

OEHHA has also developed a chronic Reference Exposure Level (REL) for Cr6. A chronic REL is a health-based benchmark that is set at a level at or below which adverse non-cancer health effects are unlikely to occur in the general human population when exposed continuously over a lifetime. Levels above the REL do not indicate the health effects will occur, but rather, that the chances of these health effects occurring increase at levels above the REL. Non-cancer health effects associated with Cr6 include nasal, throat, or respiratory irritation or allergies. The chronic REL for Cr6 is $200 \text{ ng}/\text{m}^3$ in air ($0.2 \text{ }\mu\text{g}/\text{m}^3$).