

Chromium and Health - A Summary

Chromium is a metallic element which exists primarily in the mineral, chromite. This mineral is the main constituent of chrome ore and the only commercial source of chromium. After processing, chromium occurs in several forms, also called oxidation states:

- **Metallic (Chromium 0)** is found mainly in alloys such as stainless steel, but also in chrome-plated objects. Over the last fifty years stainless steel has made it possible, in a dramatic way, to improve hygiene in the food industry, in hospitals and in the home.
- **Trivalent (Chromium III)** occurs naturally in the environment and is the most stable, both in nature and in biological systems. It is an essential micro-nutrient in the body and combines with various enzymes in transforming sugar, protein and fat. Refer to: ICDA: The Chromium File, N° 6 "Chromium as an Essential Nutrient". Chromium (III) is also used in a number of commercial products including dyes, paint pigments and salts for leather tanning.
- **Hexavalent (Chromium VI)** occurs in a range of compounds that are used in industrial processes such as chrome plating.



Effects of Short-Term Exposure

Metallic chromium and chromium alloys are essentially inert and do not cause any adverse health effects. Soluble trivalent chromium substances can be irritating to the eyes and skin, but this effect is usually related to their acidic nature. Some people can be 'chromium-sensitive', in which case trivalent chromium compounds can cause skin rashes.

By contrast, hexavalent chromium is hazardous by all exposure routes:

- Inhalation may cause acute toxicity, irritation and ulceration of the nasal septum and respiratory sensitisation (asthma)
- Ingestion may affect kidney and liver functions
- Skin contact may result in systemic poisoning, damage or even severe burns, interference with the healing of cuts or scrapes which, if not treated promptly, may lead to ulceration and severe chronic allergic contact dermatitis. Refer to: ICDA: The Chromium File, N° 2 "A Review of Skin Sensitisation Caused by Chromium".
- Eye exposure may cause permanent damage.

Effects of Long-Term Exposure

Exposure to metallic chromium and chromium alloys does not cause any adverse health effects and trivalent chromium does not normally cause any adverse health effects.

Exposure to hexavalent chromium, if prolonged or repeated, may lead to perforation of the nasal septum. Long-term exposure to high concentrations of hexavalent chromium, as encountered historically in certain occupations, has been associated with an increased risk of respiratory cancer. Nevertheless, workplace practices and standards considered acceptable several decades ago are today regarded as completely unsatisfactory.

The International Agency for Research on Cancer (IARC) has concluded that "Chromium (VI) is carcinogenic to humans (Group 1)". There is, however, no scientific evidence for a correlation between exposure to hexavalent chromium and other forms of cancer.

The Committee within the European Chemicals Bureau responsible for hazard classification has approved rating hexavalent chromium products as capable of causing heritable genetic damage and toxic for reproduction based on animal studies.

There is no scientific evidence for any adverse acute or chronic health effects caused by exposures at typical environmental concentrations. The body's ability to convert small quantities of hexavalent chromium to trivalent chromium reduces or eliminates the harmful effects of the former - unless, of course, the body is overburdened by the exposure.

Consumer Products: Chromium is generally present in its metallic or trivalent form, both of which are stable throughout the lifetime of the product. Nearly 90% of chromium usage today goes into stainless steel and other speciality steels, where the chromium values are recycled to a very high degree.

Environment: Hexavalent chromium is normally converted to its naturally stable trivalent state. This newly-formed trivalent chromium becomes chemically fixed, has low bio-availability, accumulates to a limited degree in plants grown for food and does not bio-magnify through the food chain.

For further information, refer to: ICDA: The Chromium File, N° 8 "Chemical Transformations of Chromium in Soils: Relevance to Mobility, Bio-Availability and Remediation".