# Hexavalent Chromium: Summary of Health and Environmental Effects

*This one-page fact sheet has been developed by TURI to help Massachusetts companies, community organizations and residents understand the chemical's use and health and environmental effects.*

## Overview

The hazards of hexavalent chromium compounds are significantly different from those of non-hexavalent chromium compounds. Hexavalent chromium compounds are confirmed human carcinogens, mutagens and developmental toxicants and have high acute toxicity. Non-hexavalent chromium compounds do not pose the same level of concern with regard to either chronic or acute toxicity.

Until 2011, all chromium compounds were treated as a single category under TURA. Starting in reporting year 2012, hexavalent chromium compounds are reportable as a separate category under TURA. The hexavalent chromium compounds category has been designated as a Higher Hazard Substance under TURA, so the reporting threshold is 1,000 lb/year.

## Terminology

Chromium exhibits a wide range of possible oxidation states (or "valence states"), ranging from chromium(-II) to chromium(VI).

Chromium compounds are stable in the trivalent state (III or +3) and occur in nature in ores, such as ferrochromite.

The hexavalent (VI or +6) form is the second most stable state. Hexavalent chromium rarely occurs naturally; it is usually produced from industrial activity.

## Acute (Short-Term) Health Effects

Hexavalent chromium exposure has been documented to cause several short-term and intermediate effects including, but not limited to, respiratory irritation, nosebleeds, asthma, sensitization, skin burns and dermatitis.[1]

## Chronic (Long-Term) Health Effects

The International Agency for Research on Cancer (IARC) classifies hexavalent chromium compounds in Group 1 (carcinogenic to humans). In contrast, trivalent chromium compounds are Group 3 (not classifiable with regard to carcinogenicity to humans).

Exposure to hexavalent chromium is associated with lung cancer and nasal and sinus cancer.[2] Exposure can also cause damage to the nasal mucous membrane, perforation of the nasal septum, and asthma. If inhaled through the mouth, it can cause periodontitis and gingivitis.

Impacts of chronic hexavalent chromium skin exposure include dermatitis, hypersensitivity reactions, eczema, and kidney or liver damage. The characteristic lesions resulting from hexavalent chromium exposure are referred to as "chrome holes" or "chrome ulcers." Chronic eye exposure can result in conjunctivitis.[3]

Hexavalent chromium is a mutagen, a developmental toxicant, and a renal toxicant.[4] [5] [6]

Both hexavalent chromium compounds and non-hexavalent chromium compounds are recognized by the Association of Occupational and Environmental Clinics (AOEC) as asthmagens.[7]

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[1] Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile for Chromium.* ATSDR, September 2012. Available at http://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=62&tid=17.

[2] National Institute for Occupational Safety and Health (NIOSH), *Criteria for a Recommended Standard: Occupational Exposure to Hexavalent Chromium.* NIOSH Publication No. 2013 – 128, January 2013. Available at http://www.cdc.gov/niosh/docs/2013-128/pdfs/2013_128.pdf.

[3] ATSDR 2012.

[4] www.expub.com; 6 RTECS citations found under 'Mutation Data.'

[5] California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), http://oehha.ca.gov/prop65/prop65_list/newlist.html

[6] EPA Toxicological Review of Hexavalent Chromium, (CAS No. 18540-29-9), In Support of Summary Information on the Integrated Risk Information System (IRIS) August 1998. http://www.epa.gov/iris/toxreviews/0144tr.pdf

[7] Association of Occupational and Environmental Clinics Asthmagen List: http://www.aoecdata.org/ExpCodeLookup.aspx