

Attachment I

Health Effects Summary for Inhaled Hexavalent Chromium

Hexavalent Chromium is a toxic form of the element chromium. Hexavalent chromium compounds are man-made and used in many different industries. Exposure to chromium in the workplace has been found to harm health, and cause a number of effects listed below.

- Lung cancer in workers who breath hexavalent chromium in the air
- Irritation and damage to the nose, throat, and lung if hexavalent chromium is breathed in at high levels
- Irritation or damage to the eyes or skin if in contact at high concentrations
- Some workers can become allergic to hexavalent chromium, so that inhaling such compounds can cause asthma symptoms
- Some workers can also develop an allergic skin reaction consisting of a red, itchy rash from handling liquids or solids containing hexavalent chromium

A major concern with exposure to hexavalent chromium is an increased risk for cancer with long term exposures. Studies in occupational environments have found increased risks of lung cancer. These included exposure to hexavalent chromium among workers engaged in chromate production, chromate pigment production, and chromium plating.

Hexavalent chromium compounds are listed as Toxic Air Contaminants by the California Air Resources Board. The California Environmental Protection Agency's (CalEPA) Office of Environmental Health Hazard Assessment has reviewed the cancer causing potential of hexavalent chromium compounds, and has established a potency factor for cancer risk from breathing in hexavalent chromium at levels that could occur in the environment. The potency factor developed by CalEPA, can be used to calculate the risk of contracting cancer over a lifetime of exposure.

Ambient measurements of hexavalent chromium are generally expressed in nanograms per cubic meter, or ng/m^3 . A nanogram is one billionth of a gram.

At a level of $1 \text{ ng}/\text{m}^3$ exposure over a 70-year-lifetime, the estimated additional cancer risk is 150 per million. This means that if a population of 1 million individuals were to be exposed to a concentration of $1 \text{ ng}/\text{m}^3$ of hexavalent chromium over a 70-year-lifetime, 150 additional cancer cases would be expected in this population. This compares to a risk of cancer from all causes over a lifetime of about 1 in 4 (250,000 per million).

CalEPA has also reviewed the non-cancer effects of hexavalent chromium, and has established an inhalation Chronic Reference Exposure Level of $200 \text{ ng}/\text{m}^3$ for hexavalent chromium compounds found in dusts. The Chronic Reference Exposure Level is a concentration in the air at which no adverse non-cancer health effects are expected.

A more stringent level for chronic exposures has been set by CalEPA for hexavalent chromium in the form of chromic acid mists. Chromic acid is a liquid acid used in specialized industrial processes such as in the electroplating industry. The Chronic Reference Exposure Level for hexavalent chromium as chromic acid mist is 2 ng/m³. Environmental exposures are generally to dusts containing chromates, and not to chromic acid mists that are in the form of liquid droplets.

References for Further Information

OSHA Fact Sheet: Health Effects of Hexavalent Chromium
Occupational Safety and Health Administration, U.S. Department of Labor.
Available at:

http://www.osha.gov/OshDoc/data_General_Facts/hexavalent_chromium.pdf

Chromium Hexavalent Compounds

Report on Carcinogens, Eleventh Edition; U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program. Available at:

<http://ntp.niehs.nih.gov/ntp/roc/eleventh/profiles/s045chro.pdf>

Toxicological Profile for Chromium

U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry

Available at: <http://www.atsdr.cdc.gov/toxprofiles/tp7.html>

Chromium (Hexavalent)

Technical Support Document for Describing Available Cancer Potency Factors
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section, May 2005, p. B-191

Available at: http://www.oehha.ca.gov/air/hot_spots/pdf/May2005Hotspots.pdf

Hexavalent Chromium Chronic Toxicity Summary

Chronic Exposure Reference Levels, Office of Environmental Health Hazard Assessment, CalEPA. Available at:

http://www.oehha.ca.gov/air/chronic_rels/pdf/hexChroms.pdf

Chromium Compounds

Hazardous Substances Data Base, National Library of Medicine

Available at: <http://toxnet.nlm.nih.gov>

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