CHROMIUM
(Cr) CAS #7440-47-3 (Metal)
Forms include metal (Cr), trivalent salts (Cr^{3+}) and hexavalent salts (Cr^{6+})

SOURCE/USE

Metallic chromium is produced from Cr (III) which occurs in ores. The metal is used in alloys, especially in steels. Cr (III) is an essential nutrient in humans, and is used industrially for leather tanning as well as in refractory materials. Cr (III) is the most stable valence state. Chromium (VI) is the form in salts of chromic acid. Virtually all Cr (VI) compounds are man made. These are used in chrome electroplating, creation of dyes and pigments and a variety of other applications. Chromium is expected to be one of the more toxicologically important air contaminants found during remediation projects.

ROUTES OF EXPOSURE

Chromium (III) occurs in many foods and some dietary intake is essential to human health because of its role in metabolism as a cofactor or potentiator of insulin actions. Cr (III) salts are only poorly absorbed after inhalation, ingestion or skin exposures. More soluble salts are somewhat better absorbed. Chromium (VI) salts are better absorbed than Cr (III) via all three routes of exposure. Chromium (VI) is mostly reduced to Cr (III) once it has been absorbed. Metallic chromium is seldom absorbed.

Although the risk of off-post acute exposure to chromium as a result of the RMA remediation activity is very small, any such exposure would very likely be via inhalation. Also, the concentrations resulting in acute clinical effects discussed in this document reflect occupational exposures or animal studies and are much higher than those likely to be encountered at the fence line during remediation at the RMA. Gastrointestinal absorption of chromium can occur from swallowing mucus cleared from the lungs containing inhaled particles. Metallic Cr is a steel gray, brittle metal. Most Cr (III) salts and especially Cr (VI) salts are yellow or yellowish crystals or, when dissolved, solutions.

Applicable Standards and Limits		
	Cr (III)	Cr (VI)
ATSDR intermediate MRL		0.02 µg/m^3
OSHA PEL	0.05 mg/m^3	Not Available
OSHA STEL	Not Available	0.1 mg/m^3
ACGIH TLV	0.5 mg/m^3	0.05 mg/m^3
NIOSH REL	0.5 mg/m^3	0.001 mg/m^3
Odor Threshold	Odorless	Odorless
RMA acute fence line criteria		ARC - 0.46 µg/m^3 MARC - 1.4 µg/m^3
RMA chronic fence line criteria		Cancer - 0.00023 µg/m^3 Noncancer - 0.10 µg/m^3

The goal of the remediation is exposure prevention through remedial design, environmental monitoring, and modeling. Failure of prevention could result in acute and/or chronic exposures. Following is an overview of the types of health effects associated with chromium exposure.

ACUTE HEALTH EFFECTS

Some neurologic damage occur in poisonings, but CNS is not a main target.

The respiratory system is a main target for Cr (VI). Severe irritation with nasal ulceration, bleeding, crusting and perforation and ulcerations of mouth and pharynx may occur with airborne Cr (VI) exposures. Severe asthma, bronchitis, emphysema and increased risk of death from lung diseases are related to Cr (VI) as seen in exposed workers. Cr (III) exposures in both humans and animals do not lead to these outcomes.

Chromium (VI), but not Cr (III), causes severe, deep skin ulcers (chrome sores) and severe eye damage. The skin sores will heal if exposure ceases. Chromium (III) is an active allergic agent, although allergy is usually induced by Cr (VI) exposure.

Acute ingestion of Cr (VI) causes caustic burns and hemorrhage in the GI tract. Workers experienced ulcers, pain and bleeding. Liver toxicity occurs late in the course in poisonings. Chromium (III) does not produce these toxic GI effects.

Kidney damage, which can reverse after dialysis in some cases, occurs in acute poisonings by Cr (VI). Chromium (III) does not produce these toxic renal effects.

Rupture of red blood cells can occur in poisonings. The asthma and allergic dermatitis are manifestations of effects on the immune system. In some animals, Cr (VI), but not Cr (III), is toxic to the fetus and produced significant malformations.

CHRONIC HEALTH EFFECTS

EPA has classified Cr (VI) as a known human carcinogen. Chromium (III) is not classified as a human carcinogen. Kidney damage from longer term exposure is a concern.