CHROMIUM

FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINANT

GENERAL INFORMATION

Synonyms
- None

Chemical Description:
- A relatively rare, naturally occurring element (occurs as various salts) in the earth's crust

Properties:
- A metal which exists in trivalent and hexavalent valence (oxidation) states, the trivalent being the more prevalent state
- Exists principally as tri- and hexavalent chromium salts, both of which are stable in water and exist in dynamic equilibrium with each other
- Water solubility of chromium salts is compound specific
- Trivalent chromium (CrIII) is oxidized to hexavalent chromium (CrVI) in the presence of chlorine at concentrations similar to those used to disinfect drinking water

Production and Use:
- Chromium and its salts (chromite is the most widely used ore) have a variety of uses
  - chrome alloys, metal refinishing, and corrosion resistance
  - in the leather tanning industry
  - in the textile industry
  - in pigments and paints
  - in fungicides and wood preservatives

ENVIRONMENTAL PROFILE

Occurrence:
- Estimated that occurrence above the MCL in drinking water is negligible
- Naturally occurs in soil and, as a consequence, in food
- Data indicates that detection of chromium in surface and ground water supplies are usually the result of naturally-occurring chromium leaching from mineral deposits
- Exists mainly in the trivalent or hexavalent states in natural bodies of water

Releases:
- Contamination of water by chromium is generally a result of runoff from old mining operations and improper waste disposal from plating operations

Environmental Fate:
- **Released to air:** will adsorb to particulate matter in air; not expected to exist in gaseous form, likely to be relatively unreactive, removed from air by wet and dry deposition
- **Released to soil:** limited soil mobility (will adsorb to soil particles) and is likely to remain in the upper 5 cm. of soil, uptake of chromium in plants is generally low, not likely to migrate to ground water
- **Released to surface waters:** highly persistent in water, will adsorb to suspended particulate matter and ultimately be deposited in sediments
- High potential for bioaccumulation, especially in fish and other aquatic organisms

HEALTH EFFECTS

Humans:
- CrIII is an essential nutrient for the metabolism of carbohydrates when consumed within the Recommended Daily Intake range of 0.05-0.2 mg/day
- Only CrVI crosses cell membranes, it is reduced to CrIII intracellularly
- CrVI compounds are generally more toxic than CrIII compounds:
  - Chronic inhalation of dust or air containing CrVI may cause respiratory problems
  - Chronic and subchronic dermal exposure to solutions containing high levels of CrVI may cause skin irritation and/or ulceration of the skin

Experimental Animals:
- Low oral toxicity because it is not well absorbed in the gastrointestinal tract
  - Both short-term, and long-term drinking water studies with high levels of both CrIII and CrVI showed no adverse health effects
- High mutagenic potential
- Equivocal evidence on whether ingestion of drinking water contaminated by chromium causes cancer

REGULATORY PROFILE

Existing Standards:

- **Clean Air Act (CAA):** Not regulated
- **Clean Water Act (CWA):**
  Criteria established
- **Resource Conservation and Recovery Act (RCRA):**
  Not regulated
- **Superfund (CERCLA):**
  - Hazardous waste
  - **SARA:** Toxic chemical
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):**
  Registered (Chromium compounds)
- **Toxic Substances Control Act (TSCA):**
  Not regulated

HEALTH INFORMATION

Maximum Contaminant Level Goals (MCLG):

- Non-enforceable levels based solely on an evaluation of possible health risks and exposure, and taking into consideration a margin for public safety
- Set at 0.1 mg/L to protect against adverse health effects

MCLG for Chromium = 0.1 mg/L
(effective July 1992)

Maximum Contaminant Levels (MCL):

- Legally enforceable levels for contaminants in public drinking water supplies
- Based on health risks associated with the contaminants, analytical methods for their assay, and water treatment feasibility and practicality aspects
- Exceedance of the MCL in drinking water may result in adverse effects which will depend upon the contaminant concentration in water, amount of water/contaminant ingested, length of exposure, and other biological parameters
- Current MCL = 0.05 mg/L

MCL for Chromium = 0.1 mg/L
(effective July 1992)

EPA Health Advisories (HA):

- **Short-term HAs:** Provide acceptable concentrations of contaminants in water for up to 10 day exposures, primarily to evaluate the public health risk resulting from an accidental spill or an emergency contamination situation
- **Longer-term HAs:** Provide guidance for persistent water contamination situations to cover a period of up to 7 years
- **Lifetime HAs:** Derived in the same way as an MCLG

Health Advisories

Short-term HA for a child = 1 mg/L
Longer-term HA for a child = 0.2 mg/L
Longer-term HA for an adult = 0.8 mg/L
Lifetime HA = 0.1 mg/L

ANALYTICAL METHODS

- Graphite Furnace Atomic Absorbtion
  EPA Method 218.2
- Inductively Coupled Plasma
  EPA Method 200.7

WATER TREATMENT

Permanent Treatment:

Best Available Technology (BAT):

- Coagulation/Filtration
- Lime Softening
- Reverse Osmosis
- Ion Exchange

SHORT-TERM HAZARD ELIMINATION

- If the drinking water standards are exceeded, install BAT or use an alternative drinking water supply such as bottled water

ADDITIONAL HELP

- State or county health officials can indicate a certified laboratory for testing
- Experts in the state Department of Environmental Protection or Natural Resources may also be of help
- The EPA has toll-free numbers for further information on drinking water quality, treatment technologies, for obtaining Health Advisories, and for other regulatory information
- EPA Hotlines are available Monday through Friday
  - **Safe Drinking Water:** **800-426-4791**
  - **National Pesticides:** **800-858-7378**
  - **Superfund/RCRA:** **800-424-9346**
- For information on the Clean Water Act, call (202) 260-7301
- For information on the Toxic Substances Control Act, call (202) 554-1404
- For information on the Clean Air Act, call (919) 541-2777