PUBLIC HEALTH STATEMENT
Chromium
CAS # 7440-47-3

Division of Toxicology and Human Health Sciences **September 2012**

This Public Health Statement is the summary chapter from the Toxicological Profile for chromium. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-800-232-4636.

This public health statement tells you about chromium and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Chromium has been found in at least 1,127 of the 1,699 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which chromium is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to this substance may be harmful.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to chromium, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), the form (chromium VI as opposed to chromium III), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

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What is chromium?

Description	Chromium is a naturally-occurring element found in rocks, animals, plants, and soil, where it exists in combination with other elements to form various compounds. The three main forms of chromium are: • chromium(0), • chromium(III), and • chromium(VI). Small amounts of chromium(III) are needed for human health.
Uses • ***manufacturing***	Chromium is widely used in manufacturing processes to make various metal alloys such as stainless steel.
Consumer products	Chromium can be found in many consumer products such as: • wood treated with copper dichromate, • leather tanned with chromic sulfate, and • stainless steel cookware. • metal-on-metal hip replacements

What happens to chromium when it enters the environment?

Sources	Chromium can be found in air, soil, and water after release from industries that use chromium, such as industries involved in electroplating, leather tanning, textile production, and the manufacture of chromium-based products. Chromium can also be released into the environment from the burning of natural gas, oil, or coal.
Break down • ***air*** • ***water and soil***	Chromium does not usually remain in the atmosphere, but is deposited into the soil and water. Chromium can change from one form to another in water and soil, depending on the conditions present.

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How might I be exposed to chromium?

Air exposure	You can be exposed to trace levels of chromium by breathing air containing it. Releases of chromium into the air can occur from: • industries using or manufacturing chromium • living near a hazardous waste facility that contains chromium • cigarette smoke Rural or suburban air generally contains lower concentrations of chromium than urban air. • <10 ng/m^3 in rural areas • 0–30 ng/m^3 in urban areas • as a result of smoking, indoor air contaminated with chromium can be 10–400 times greater than outdoor air concentrations
Workplace air	A large number of workers are potentially exposed to chromium. The highest potential exposure occurs in the metallurgy and tanning industries, where workers may be exposed to high air concentrations.
Water and soil	Chromium is occasionally detected in groundwater, drinking water, or soil samples. Some ways to be exposed to chromium include: • drinking water containing chromium • bathing in water containing chromium
Food	The general population is most likely to be exposed to trace levels of chromium in the food that is eaten. Low levels of chromium(III) occur naturally in a variety of foods, such as fruits, vegetables, nuts, beverages, and meats.

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How can chromium enter and leave my body?

Enter your body • ***inhalation***	When you breathe air containing chromium, some of the chromium will enter your body through your lungs. Some forms of chromium can remain in the lungs for several years or longer.
• ***ingestion***	A small percentage of ingested chromium will enter the body through the digestive tract.
• ***dermal contact***	When your skin comes in contact with chromium, small amounts of chromium will enter your body.
Leave your body	Chromium(VI) is changed to chromium(III) in the body. Most of the chromium leaves the body in the urine within a week, although some may remain in cells for several years or longer.

How can chromium affect my health?

This section looks at studies concerning potential health effects in animal and human studies.

Respiratory tract	The most common health problem in workers exposed to chromium involves the respiratory tract. These health effects include irritation of the lining of the nose, runny nose, and breathing problems (asthma, cough, shortness of breath, wheezing). Workers have also developed allergies to chromium compounds, which can cause breathing difficulties and skin rashes. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III). However, the concentrations causing respiratory problems in workers are at least 60 times higher than levels normally found in the environment. Respiratory tract problems similar to those observed in workers have been seen in animals exposed to chromium in air.
Stomach and small Intestine	The main health problems seen in animals following ingestion of chromium(VI) compounds are to the stomach and small intestine (irritation and ulcer) and the blood (anemia). Chromium(III) compounds are much less toxic and do not appear to cause these problems.
Male reproductive system	Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).
Cancer	The International Agency for Research on Cancer (IARC) has determined that chromium(VI) compounds are carcinogenic to humans. The National Toxicology Program 11th Report on Carcinogens classifies chromium(VI) compounds as known to be human carcinogens. In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Mixed results have been found in studies of populations living in areas with high levels of chromium(VI) in the drinking water. In laboratory animals, chromium(VI) compounds have been shown to cause tumors to the stomach, intestinal tract, and lung.

How can chromium affect children?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Effects in children	There are no studies that have looked at the effects of chromium exposure on children. It is likely that children would have the same health effects as adults. We do not know whether children would be more sensitive than adults to the effects of chromium.
Developmental effects	There are no studies showing that chromium causes birth defects in humans. In animals, some studies show that exposure to high doses during pregnancy may cause miscarriage, low birth weight, and some changes in development of the skeleton and reproductive system. Developmental effects in animals may be related, in part, to chromium toxicity in the mothers.

How can families reduce the risk of exposure to chromium?

Avoid tobacco smoke	Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
Avoid older pressure treated lumber	In the past, pressure treated wood used chromated copper arsenate; however, the use of this product in residential settings was discontinued effective December 31, 2003. Avoiding older pressure treated lumber can reduce your risk of exposure to chromium. You may also have your water tested to ensure that you are not exposed to high levels of chromium.
Launder clothing from work sites	Clothing or items removed from the workplace may contain chromium if you are employed in a setting where occupational exposure is significant. Therefore, common sense hygiene and laundry practices may help avoid unnecessary exposures.

If your doctor finds that you have been exposed to significant amounts of chromium, ask whether your children might also be exposed. Your doctor might need to ask you state health department to investigate.

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Is there a medical test to determine whether I have been exposed to chromium?

Detecting exposure	Since chromium is a required nutrient in the body and is normally present in food, chromium is normally present in blood, urine, and body tissues.
Measuring exposure	Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

What recommendations has the federal government made to protect human health?

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as "not-to-exceed" levels. These are levels of a toxic substance in air, water, soil, or food that do not exceed a critical value. This critical value is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it.

Some regulations and recommendations for chromium include the following:

Levels in drinking water set by EPA	The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water. EPA currently seeks voluntary monitoring of hexavalent chromium in drinking water by municipalities. However, it is reviewing health effects data of hexavalent chromium and may set limits on its levels in drinking water in the future.
Levels in bottled water set by FDA	The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.
Levels in workplace air set by OSHA	OSHA set a legal limit for chromium(VI) of 0.005 mg/m^3 chromium in air averaged over an 8-hour work day, for chromium(III) of 0.5 mg/m^3 chromium in air averaged over an 8-hour work day, and for chromium(0) of 1.0 mg/m^3 chromium in air averaged over an 8-hour work day.
Levels in workplace air setby NIOSH	NIOSH recommends an exposure limit of 0.5 mg/m^3 chromium as chromium metal and chromium(II) and chromium(III) compounds in air averaged over an 8-hour work day. NIOSH also recommends an exposure limit of 0.001 mg/m^3 for chromium(VI) compounds in air averaged over 10-hour work day.

Where can I get more information?

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and

technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences
1600 Clifton Road NE
Mailstop F-57
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: http://www.ntis.gov/