OhioEPA
State of Ohio Environmental Protection Agency

Pollution Prevention Fact Sheet

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Persistent, Bioaccumulative and Toxic Chemicals

Chromium and Chromium Compounds

Chromium is naturally found in rocks, animals, plants, soil and in volcanic dust and gases. It is used in many industrial settings. Chromium is a gray-steel solid metal at room temperature. Chromium compounds are tasteless and odorless. Chromium does not degrade and is not destroyed by combustion. It cycles between the soil, the atmosphere, surface waters and ground water. Trivalent chromium is considered safe and is an essential nutrient. Hexavalent chromium is a known carcinogen. Chromium usage and pollution should be reduced wherever possible.

In 1999, Ohio's hazardous waste program regulated facilities reported generating 44 million pounds of chromium and chromium compounds in waste.

What are PBT chemicals?

Persistent, bioaccumulative and toxic (PBT) chemicals do not readily break down in the environment, are not easily metabolized, may accumulate in human or ecological food-chains through consumption or uptake and may be hazardous to human health or the environment. A PBT chemical, once released to the environment, may present increasing long-term toxic effects to human health and the environment, even if the release was of a small amount. The U.S. Environmental Protection Agency (U.S. EPA) has created a priority in its hazardous waste minimization program to reduce the presence of PBT chemicals, promote pollution prevention and avoid the transfer of PBT chemicals across environmental media.

Chromium is a high priority PBT chemical.

What is the adverse effect of chromium?

Hexavalent chromium or chromium(VI) is a recognized carcinogen. Exposure to chromium(VI) in dust is associated with increased incidence of lung cancer and is known to cause inflammation of the skin (dermatitis). In contrast, trivalent chromium or chromium(III) is considered relatively safe. It is an essential nutrient that helps the human body utilize sugar, protein and fat.

It is not known if exposure to chromium will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to chromium(VI). Studies with mice have shown that chromium crosses the placenta and concentrates in fetal tissue. Therefore, pregnant women who are exposed to chromium in the workplace or by living near chromium waste sites may transfer chromium from their blood into the baby where it may build up at levels greater than in the mother. There is some evidence that chromium can be transferred from the human mother to infant through breast milk.

Where is chromium found?

Chromium is present in the environment in several different forms. The most common forms are chromium(0), trivalent (or chromium(III)), and hexavalent (or chromium(VI)). Chromium(III) occurs naturally in the environment and is an essential nutrient required by the human body to promote the action of insulin in body tissues so that sugar, protein and fat can be used by the body. Chromium(VI) and chromium(0) are generally produced by industrial processes.

The metal chromium, or chromium(0), is a steel-gray solid with a high melting point. It is used mainly for making steel and other alloys. The naturally occurring mineral chromite in the chromium(III) form is used as brick lining for high-temperature industrial furnaces, for making metals, alloys and chemical compounds. Chromium compounds, mostly in chromium(III) or chromium(VI) forms produced by the chemical industry, are used for chrome plating, the manufacture of dyes and pigments, leather tanning and wood preserving. Smaller amounts are used in drilling muds, rust and corrosion inhibitors, textiles and toner for copying machines.

Chromium enters the environment mostly in the chromium(III) and chromium(VI) forms as a result of natural processes and human activities. Emissions from burning coal and oil and producing steel can increase chromium(III) levels in air.

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Stainless steel welding, chemical manufacturing and use of chromium(VI) compounds can increase chromium(VI) levels in air. Waste streams from electroplating can discharge chromium(VI). Leather tanning and textile industries as well as those that make dyes and pigments can discharge both chromium(III) and chromium(VI) into waters. The levels of both chromium(III) and chromium(VI) in soil increase mainly from disposal of commercial products containing chromium, chromium waste from industry and coal ash from electric utilities.

Some of the most common sources of exposure to chromium include:

• Daily activities - A person can be exposed by breathing air, drinking water, or eating food containing chromium or through skin contact with chromium or chromium compounds. The level of chromium in air and water is generally low. Chromium(III) occurs naturally in many foods and is an essential nutrient for humans. An average adult in the United States takes in an estimated 60 micrograms of chromium daily from food. This contrasts with the FDA's daily recommended intake of 50-200 micrograms. Chromium(VI), however, may occur in contaminated well water. One also may be exposed to chromium from using consumer products such as household utensils, wood preservatives, cement, cleaning products, textiles and tanned leather.

• Occupation - Some industries most likely to expose workers to chromium(VI) include: stainless steel welding, chromate production, chrome plating, ferrochrome industry and chrome pigments.

• Site contamination - These include: landfill sites with chromium-containing wastes, industrial facilities that manufacture or use chromium and chromium compounds, cement-producing plants, industrial cooling towers that previously used chromium as a rust inhibitor, waterways that receive industrial discharges from electroplating, leather tanning and textile industries.

Who is at risk?

Workers in industries that process or use chromium or chromium compounds can be exposed to higher-than-normal levels of chromium. An estimated 305,000 workers in the U.S. are potentially exposed to chromium and chromium compounds in the workplace.

People living near contaminated sites may be exposed to higher-than-normal levels of chromium. Children who live near waste sites where chromium is found are likely to be exposed to higher environmental levels of chromium through breathing, touching soil and eating contaminated soil. Children at age five or younger from these areas have been shown to have higher levels of chromium in their urine than adults and children living outside of contaminated areas. Very few studies have looked at how chromium can affect the health of children. It is not known whether children differ from adults in their susceptibility to chromium.

How can people reduce risk of chromium exposure?

Chromium can be measured in the hair, urine, serum, red blood cells and whole blood. Since chromium(III) is an essential nutrient, low levels of chromium are normally found in body tissues and urine. Tests for chromium exposure are most useful for people exposed to high levels. These tests cannot determine the exact levels of chromium exposure or predict whether health effects will occur.

To reduce the risk of occupational exposure, ask why chromium is used in the manufacturing of your company's products. Also inquire about how it can be removed or replaced. Discourage children from eating dirt. Make sure children wash their hands before meals and at bedtime. Discourage hand-to-mouth activity in children.

Sources

Agency for Toxic Substances and Disease Registry **www.atsdr.cdc.gov**

TOXNET, National Library of Medicine, National Institutes of Health **www.toxnet.nlm.nih.gov**

The Office of Pollution Prevention was created to encourage multi-media pollution prevention activities in Ohio to reduce risk to public health, safety, welfare and the environment. Pollution prevention stresses source reduction and, as a second choice, environmentally-sound recycling while avoiding cross media transfers. The office develops information related to pollution prevention, increases awareness of pollution prevention opportunities, and can offer technical assistance to business, government, and the public.

For more information, visit the Office of Pollution Prevention's Web site at www.epa.state.oh.us/opp

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