HBM4EU science and policy for a healthy future

CHROMIUM (VI): WHAT YOU NEED TO KNOW

WHAT IS CHROMIUM (VI)?

Chromium is a relatively common chemical (Cr). It is found naturally in rocks, soil, plants, animals and volcanic dust and gases. Chromium compounds form a large and varied group of chemicals. They can be solid, liquid or gas form and have no taste and no odor. The most abundant forms of Cr are metallic chromium (Cr(0)), trivalent chromium (Cr(III)) and hexavalent chromium (Cr(VI)). Under some conditions, chromium forms can change from one to another.
Chromium metal is steely-grey and shiny. It has high corrosion resistance and hardness and is used mostly in the production of stainless steel and chrome plating. Chromium metal is not harmful to human health.
Cr(III) occurs naturally in living organisms. It may be an essential nutrient in trace amounts. It is found in some industrial processes and has a low toxicity.
Cr(VI) is very toxic. It is classified as a carcinogen, which means that it can cause cancer. Its occurrence is rare naturally. Most of Cr(VI) compounds are man-made (products or by-products) and human-caused Cr(VI) contamination.
Exposure to chromium (VI) is mainly occupational.

How is Cr(VI) used?

Cr(VI) is formed from metallic Cr (Cr(0)) in hot temperatures in the manufacturing of stainless steel and other chromium containing alloys, as well as during welding and cutting of these products. Cr(VI) is used in special paints, primers and in surface coating e.g. by electroplating.

How can Cr(VI) enter your body?

Exposure to Cr(VI) happens mainly through inhalation of Cr(VI)-contaminated dust, fumes or mist at workplaces or contaminated air; by skin contact through handling Cr(VI)-containing solutions, coatings and cements (restriction of Cr(VI) up to 2 ppm*) at workplaces or using Cr(VI) paint pigments; by swallowing it, or through handling food contaminated with dust on your hands at workplaces.

UNDERSTANDING CHEMICAL RISK

The **risk** of harm from any chemical results from the hazard associated with the chemical, combined with exposure to the chemical.

Hazard refers to the properties of the chemical that make it toxic, meaning it can cause harm to human health.

Exposure describes the amount of a chemical that an individual comes into contact with, as well as the frequency of exposure.

The term **threshold** is used to indicate the concentration, or level, of a chemical to which people can be exposed without suffering adverse health effects. Exposure up to this level is considered safe. Some chemicals can cause health effects at any concentration and are considered as having no threshold. For such chemicals, no level of exposure is safe.

How might Cr(VI) affect health?

Detecting exposure to Cr(VI) does not necessarily mean that the people's health has been harmed.

This depends on the concentration, duration of exposure, age and health status of the person.

There are maximum recommended values for Cr(VI) exposure, however it is a genotoxic carcinogen (causes damage to your genetic code) hence there is no safe threshold. As with all chemical exposures, the risk related to Cr(VI) exposure depends on your personal traits and habits, how much of the chemical you are exposed to, how and when you are exposed, how long and how often the exposure occurred, and whether other chemicals are present.

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Human exposure to Cr(VI) in Europe

Exposure to Cr(VI) is mainly occupational with the main source being through breathing contaminated workplace air, hence a significant portion may accumulate in the lungs. To understand human occupational exposure, urinary chromium is measured.
Single exposure to Cr(VI) may cause irritation of the nose and upper respiratory tract, irritation, burns or ulcers of the skin; and eye damage from splashes. Repeated or prolonged exposure to Cr(VI) compounds will increase the risk of lung cancer, as well as nose and nasal sinus cancer, damage to the nose including ulcers and holes in tissue flap separating the nostrils, inflammation of the lungs, allergic contact dermatitis (ACD), respiratory tract problems (e.g. asthma, cough, wheezing, rhinitis), contact dermatitis, kidney damage, damage to the reproductive system, DNA damage and gene mutation.

Human biomonitoring involves taking samples of blood and urine, and measuring the concentration of a chemical in the sample. The measurement determines the total amount of a chemical in the body, representing input from all possible sources.
Samples are taken from large numbers of people, in order to get a picture of exposure in a certain population.

What is HBM4EU doing on Cr(VI)?

HBM4EU is working to answer the following key questions on Cr(VI), to inform an evaluation of possible risks to human health and support safe use.

- Are EU workers involved in Cr(VI) activities sufficiently protected?
- Is there a level of exposure that is of concern to public health?
- Are children more at risk?
- What are the main sources of exposure to Cr(VI) for general EU population?

HBM4EU is developing specific methods of detection, such as through red blood cells and breath. These new methods of detection would give us a better picture of the exposure to Cr(VI).

For more information please see the HBM4EU webpage on chromium (VI).

How can you reduce your exposure to Cr(VI)?

At the workplace, look for safer alternatives and comply with workers' regulations on carcinogens, use the extraction equipment or other control measures correctly, use protective clothing and equipment provided, always use the washing facilities provided. If you have to wear a respirator make sure that it fits properly, it is a tight-fitting mask, that you have been fit tested and are clean shaven, that the mask is clean and in good working order, the filter is changed regularly, and it is stored in a clean/dry place, preferably a locker. Remember to report defects in enclosures, extraction equipment or other control measures to your employers. Don't eat, drink or smoke in work areas where chromium (VI) may be present.

Ensure that your medical controls include monitoring of Cr(VI).

How is the European Union protecting citizens?

Despite the fact that exposure to citizens is very limited, the European Union has taken action to reduce citizens' exposure to Cr(VI) known to cause risks to health. Legislation is also in place at occupational level.

- Maximum values are established for total chromium both in water intended for human consumption and in natural mineral waters, but no level is available specifically for Cr(VI).
- In air, the EU proposed an OEL (occupational Exposure Limit) for the hazardous Cr(VI) where the number of health problems can be substantially decreased through full compliance.
- There are established permissible exposure limit (PEL) and an action level (AL) in place for exposure to Cr(VI).
- The use of Cr(VI) requires a special authorisation.
- Cr(VI) use is restricted in leather above a specific amount. This is expected to be 80 % effective in reducing the occurrence of new Cr(VI)-related allergic dermatitis cases due to Cr(VI) in leather articles.
- The use of Cr(VI) is restricted in cement up to 2 ppm*.
- Current migration limits for Cr(VI) are specified in Toy Safety Directive to ensure their safety.
- Regarding cosmetics, because of its allergenic character, the presence of Cr(VI) as an ingredient is prohibited.

*ppm: parts per million. Equivalent to having 1 drop of a substance in 1 million drops, or 1 drop in 50 liters of water, for example.

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