Fact or Fiction?

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Chromium: Is It Really Bad for Us?

Do you have any of the following medical problems: nosebleeds, breast cancer, rashes, lymphatic cancer, lung cancer, brain cancer, lupus, stress, chronic fatigue, miscarriages, gastrointestinal cancer, Crohn's disease, spinal deterioration, kidney tumors, ovarian tumors, and "intestines eaten away," which sounds awful but doesn't describe a real disease?[1] What about your neighbors? Might they have similar health issues? If so, look around your neighborhood for a chromite ore mining facility, a tannery, an electroplating facility, or someone who does a lot of welding with stainless steel. All of these could be a source of hexavalent chromium (Cr^6). Better yet, find some firm with deep pockets such as a utility provider and look for Cr^6 in its water release.

You have found something to blame for your problems. If you want more help on how to proceed, see the movie *Erin Brockovich*. This major film with Julia Roberts portraying Ms. Brockovich, an overworked paralegal, dealt with the release of Cr^6 into the Hinkley, California water supply by Pacific Gas & Electric.[1-5]

Never mind that 25 percent of total chromium emissions in the United States comes from fossil fuel combustion.[6]

Never mind that the presence of Cr^6 in groundwater is not necessarily a threat to the groundwater, because the Cr^6 in the presence of typical soil is converted to trivalent chromium (Cr^3), which is harmless. Cr^6 is reduced to Cr^3 in soils containing common elements, such as iron, sulfur, and organic matter.[7]

Never mind that Cr^6 has never been shown to be carcinogenic to any degree when dissolved in drinking water. The only cancer that can be attributed to Cr^6 is with workers who inhaled massive amounts over many years. They have an elevated risk of developing lung and sinus cancers.[4]

Never mind that according to Michael Fumento, "No data were located in the available literature that suggested that Cr^6 is carcinogenic by the oral route of exposure." He also reports that the literature reveals numerous studies of persons living near toxic-waste sites jam-packed with Cr^6 who had no increased level of any type of disease.[1]

Never mind the work of G.E. Corbett *et al.*, who examined four human volunteers following three hours of immersion (yes, three hours of immersion below their shoulders) in water containing Cr^6 at a concentration of 22 mg/L.[8] Data from this study led to the conclusion that prolonged contact with Cr^6 at plausible water concentrations for environmental exposure is not expected to result in appreciable systemic uptake of trivalent (Cr^3) or hexavalent chromium (Cr^6). What's a plausible water concentration of Cr^6? Water turns bright yellow when containing only 5 mg/Cr^6/L, so a plausible concentration would be less than this. Beverages such as coffee, tea, orange juice, Kool Aid, and powdered lemonade spiked with either 10 or 50 mg/Cr^6/L had the capacity to reduce a concentration of >8 mg Cr^6/l within a 15-minute time frame. B.D. Kerger *et al.* report, "When considered in conjunction with studies demonstrating that the reductive capacity of gastric juices may exceed 50 mg Cr^6 daily, these observations suggest that little or no Cr^6 is likely to be absorbed orally at a reasonable water concentration of Cr^6, since tapwater is bright yellow at 5 mg Cr^6/l."[9]

Trivalent chromium content of selected foods in the United States*

Food	Average chromium content (ug/g)
Meat, fresh	0.14-0.37
Milk	<0.001-0.01
Cheese	0.030-0.56
Eggs	0.003-0.63
Seafood	0.05-0.127
Cereals	0.031-0.222
Vegetables	0.033-0.141
Fruits	0.015-0.085
Vegetable fats	0.011-0.13
Animal fats	0.007-0.18
Sugar	0.002-0.02

*Reference 12. Michael S. Bratakos, Evangelos S. Lazos and Sotirios M. Bratakos, "Chromium content of selected Greek Foods, *The Science of the Total Environment*, **290**, 47 (2002).

Some Other Facts

We all have chromium present as a trace element in our bodies in the trivalent form (Cr^3). The hexavalent form (Cr^6) is more toxic than the trivalent form because of its oxidizing potential and its easy permeation of biological membranes. (Cr^6 is able to penetrate the biological membranes, while Cr^3 is not.)[10] Thomas Jukes calculates that the approximately 6 mg of chromium in each of our bodies supplies 0.7×10^6 molecules per cell.[11] This chromium is considered as an essential trace element for human metabolism. "The amount of chromium in the diet is of great importance as chromium is involved in insulin function and lipid metabolism," report Michael Bratakos and co-authors.[12] The table shows some of their data on chromium content of foods. Liz Applegate notes, "Too little chromium may cause abnormal glucose processing; too much may hamper iron and zinc absorption. Just-right assists insulin with carbohydrate and protein metabolism."[13] The inescapable conclusion

is that it's hard to avoid chromium in our diets. And speaking of diets, chromium has one of its own. This is discussed in Jeffrey Fisher's book, *The Chromium Program*.[14] It focuses on a six-week diet and exercise plan that is heavy on grains and other foods high in chromium, and claims to provide "a trimmer, leaner body, increased endurance and stamina, and lower cholesterol."

One Last Tidbit

Believe it or not, another issue has been placed at chromium's doorstep. Chromium could be a big problem for the space program! One worry about landing on Mars is that astronauts may breathe dust containing Cr^6. At least this is what was reported in *The Oregonian* on May 15, 2002.[15] John Wilford claims that a committee (unidentified) said, "The highly oxidized hexavalent form of chromium was probably not abundant on Mars but added that it could not be certain. If there are substantial amounts of hexavalent chromium in the dust it could be a showstopper, and the way astronauts explore Mars would have to be rethought." Sounds far-fetched, but it does lead to one possibility. If Cr^6 is present in the soil of Mars, perhaps this is final proof that there once was life on the planet. Could this be remnants from a chromite mine, tannery, or perish the thought, an out-of-this-world electroplating facility that didn't clean up its waste? **P&SF**

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