

Hexavalent Chromium in Drinking Water

This fact sheet summarizes issues raised relative to hexavalent chromium (CrVI) and its detection in public water supplies as reported in the recently published Environmental Working Group (EWG) report (<http://static.ewg.org/reports/2010/chrome6/html/home.html>), as well as information recently provided by the US Environmental Protection Agency (EPA). In particular, this fact sheet focuses on what it means for drinking water in Connecticut:

What is hexavalent chromium (CrVI)?

- Chromium is an odorless and tasteless metallic element in the periodic table. Chromium is found naturally in rocks, plants, soil, volcanic dust, humans and animals. The most common forms of chromium in the environment are the trivalent, hexavalent and the metallic form, chromium-0. Trivalent chromium occurs naturally in many vegetables, fruits, meats, grains and yeast. Trivalent Chromium is a nutritionally essential element in humans and is often added to vitamins as a dietary supplement. CrVI and chromium-0 are generally produced by various industrial processes.
- Major sources of CrVI in drinking water are discharges from steel and pulp mills, metal plating operations, boiler water corrosion control applications and erosion of natural deposits of trivalent chromium which later become oxidized. At some locations, chromium compounds have been released to the environment via leakage, poor storage, or improper disposal practices.
- Chromium compounds are very persistent in the aquatic environment, mostly bound to sediments and soil.

What is the standard for CrVI in drinking water?

- There are currently no federal (EPA) or state standards for ingestion of CrVI in drinking water. The only official standard is for total chromium at a level of 100 parts per billion (ppb) or 0.100 parts per million. DPH has a significant amount of water quality data for total chromium, and has no record of any Connecticut public water system ever having exceeded the current federal standard. Total chromium continues to be regularly monitored in Connecticut's public water supplies.
- The EWG report compared detected CrVI concentrations in water to the proposed California Public Health Goal of 0.06 ppb; it is only a proposed state goal, not a final standard.
- Risk assessments conducted by California EPA and the US EPA suggest that a CrVI concentration in the drinking water of 0.06 ppb is the threshold level. This level estimates that one person in a million would get cancer from drinking water with this level throughout their lifetime. Since the EWG report, California has lowered its goal to 0.02 ppb to take into account the increased exposure and risk to small children.

- Most of the levels of CrVI detected by EWG were low, well below 1 ppb, and within range of the California Public Health Goal. This includes the level identified as being detected from Connecticut noted in the EWG report.

How could CrVI get into the drinking water that was sampled by EWG?

- It is unclear where CrVI is coming from in these water samples collected by EWG. Its widespread occurrence at generally low levels suggests that these concentrations represent natural background levels and are not necessarily from a specific source of pollution. Possible background sources in drinking water are from chromium dissolving from soil and bedrock, which is a natural part of the earth's crust.
- In certain cases, industrial discharges of chromium can affect water supplies, but Connecticut has safeguards against this type of drinking water pollution. These activities are prohibited on drinking water watersheds or within the protective radius of public drinking water wells.
- Connecticut's sources of public drinking water come from the highest quality, most protected waters in the state. Our state's pristine public drinking water sources are guarded by numerous laws intended to protect public health and to minimize any unreasonable risk to health.
- DPH continues to promote the use of only the highest quality drinking water for human consumption.

What are the health risks of drinking or using water containing CrVI?

- CrVI is a toxic form of chromium, which until now, has received very little specific testing in drinking water at levels below 1 ppb. This is because CrVI was believed to be inactivated when ingested, being converted by the stomach contents, including organic material within the stomach, to a much less toxic form, trivalent chromium.
- New toxicology data indicate that CrVI may be carcinogenic to the gastrointestinal tract of laboratory animals when ingested at high doses over their lifetime through drinking water. There is one human epidemiology study from a chromium polluted area in China which suggests that CrVI ingestion can produce stomach cancer. The drinking water concentration associated with the increased cancer risk in the animal and human studies is approximately 1000 times higher than the highest level that was found by EWG. The manner in which the high dose cancer findings relate to risk at the much lower levels of exposure possible from CrVI in tap water is an uncertainty. It is under investigation by the EPA through a comprehensive health assessment, and in studies being performed by the regulated community that will be completed later this year.
- At these very low concentrations (less than 1 ppb) non-cancer effects are unlikely. At very high doses (greater than 100 ppb) CrVI can irritate the skin and be a risk to the developing fetus. The levels that have been detected in drinking water are far below any level of potential concern for these effects.
- The potential carcinogenicity of CrVI would be due to long-term, chronic exposure; the incremental risk over the course of this year while the additional information (detailed below) is being analyzed would not be expected to add a significant health risk.

What do the results of the EWG study mean to the consumers of public drinking water?

- The EWG study raised more questions than answers. Additional research is needed to better identify the range of CrVI concentrations and their sources in drinking water.

- At this time, the general public is not advised to test for CrVI or to filter tap water to try to remove CrVI. The EWG study was only an initial screening and there is very little occurrence test data. Most of the results were quite low (less than 1 ppb) and within range of the proposed California goal. The EWG study was not made available for peer review. The analyses were not performed using an EPA approved methodology. Some of the data from the study is not available for public review.

What is the US Environmental Protection Agency (EPA) doing related to CrVI?

- The EWG prompted 10 U.S. Senators to meet with the EPA administrator on December 21, 2010 to discuss CrVI. A portion of the statement published by EPA after the meeting follows (from www.epa.gov):

“It is clear that the first step is to understand the prevalence of this problem. While the EWG study was informative, it only provided a snapshot in time. EPA will work with local and state officials to get a better picture of exactly how widespread this problem is. In the meantime, EPA will issue guidance to all water systems in the country to help them develop monitoring and sampling programs specifically for chromium-6 (CrVI). We will also offer significant technical assistance to the communities cited in the EWG report with the highest levels of CrVI to help ensure they quickly develop an effective CrVI specific monitoring program.”

- EPA has indicated that they will work with state and local officials to better determine how widespread and prevalent this possible contaminant is in drinking water throughout the United States.
- On January 11, 2011, EPA provided guidance to water systems on how they may voluntarily choose to monitor for CrVI, in addition to the compliance monitoring they are required to perform for total chromium. EPA believes that the voluntarily enhanced monitoring will enable public water systems to: better inform their consumers about the levels of CrVI in their drinking water, evaluate the degree to which other forms of chromium are transformed into CrVI in their drinking water and assess the degree to which existing treatment is affecting the levels of CrVI. The memorandum is available at: [Chromium memorandum](#)
- EPA will also offer technical expertise and assistance to communities cited in the recent EWG study with the highest levels of chromium. EPA will work with water system operators and engineers to ensure the latest testing and monitoring methods are being utilized. Once EPA’s CrVI health risk assessment is finalized at the end of 2011, EPA plans to determine if new standards for CrVI need to be established. Based on the current draft assessment, which has yet to undergo scientific peer review, it is likely that EPA will propose to tighten drinking water standards to address the health risks posed by CrVI.
- EPA has a well defined process for setting the safe level of all parameters that occur in public drinking water; the process relies on sound science in the development of both water quality monitoring data and health effects data. It is early in this process for CrVI, and the new information on CrVI occurrence and health effects will be considered in this process. EPA’s determination of a safe level will typically reflect an evaluation of occurrence data, treatment capability and feasibility, and cost.

What is the Connecticut Department of Public Health (CTDPH) doing relative to CrVI?

- DPH is closely monitoring developments at the national level in terms of EPA finalization of its CrVI toxicology assessment and further CrVI sampling in drinking water.
- DPH is working closely with EPA Region I, EPA Headquarters, and the Association of State Drinking Water

Administrators (ASDWA) to assure the use of standardized testing methods and the release of accurate and timely public health information.

- DPH will work with any public water system that chooses to proceed with the voluntary monitoring as suggested by EPA.
- DPH is also working closely with EPA to determine laboratory capacity to test for CrVI utilizing the appropriate testing methodology.
- DPH continues to promote the use of the highest quality drinking water for human consumption in order to continue to minimize the risk to public health from chemicals such as CrVI.
- DPH has convened a working group to study this issue and, if necessary, act on this information. The working group consists of engineers, analysts, laboratory staff and toxicologists within CTDPH, and water utility and local health department representatives.
- DPH will continue to work closely with EPA, the Connecticut Section of the American Water Works Association (CTAWWA), and ASDWA to review the significant amount of recent information and make informed decisions.
- DPH is a member of a small national workgroup, whose members include EPA Headquarters staff and Drinking Water Administrator staff from California, Colorado, and Alaska, to discuss future actions.

Where can I find more information?

EPA's website for Chromium: <http://water.epa.gov/drink/info/chromium/index.cfm>

EPA's sampling guidance for public water systems: <http://water.epa.gov/drink/info/chromium/guidance.cfm>

More EPA information for chromium:

<http://water.epa.gov/drink/contaminants/basicinformation/chromium.cfm>

<http://water.epa.gov/drink/contaminants/basicinformation/upload/Chromium6inDrinkingWater.pdf>

Environmental Working Group's CrVI Report: <http://static.ewg.org/reports/2010/chrome6/html/home.html>

Contact information

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ASDWA: (703) 812-9505:

USEPA: (800) 426-4791 (Safe Drinking Water Hotline)