



Frequently Asked Questions: Chromium in Municipal Drinking Water Supplies

Departmental fact sheet

01/2010

What is chromium-6?

Chromium is a naturally occurring element found in animals, plants, rocks and soils. The three most common forms of chromium found are chromium(0), chromium-3 and chromium-6. The metal chromium (chromium (0)) is used for making steel. Chromium-6 and chromium-3 are both used for chrome plating, dyes and tanning processes.

Chromium is also a vital nutrient for human life. Among other functions, chromium helps insulin bring glucose into the cells for energy. Many foods include chromium – whole grain cereals, lean meats and cheeses and some spices, such as black pepper. It's also added to vitamins.

Chromium can change easily from one form to another in soil and in water, depending on conditions. The oxidation process, for instance, is believed to convert chromium-3 to chromium-6, as it adds electrons to chromium-3.

Chromium-6 is known carcinogen when inhaled over a period of time, however, it is only recently that scientists have found evidence that suggests that ingestion of high levels of chromium-6 can form tumors. A [2007 National Toxicology Program](#) study found that rats and mice that consumed drinking water with chromium-6 in it formed a significant number of tumors.

The cancer risk from ingestion of chromium-6 is a chronic one, not an acute one. Chronic health risk levels are calculated assuming 30 years of exposure in a 70-year lifespan.

Is there a state drinking water standard for chromium-6?

Neither Missouri nor the U.S. EPA have promulgated a health-based rule or standard for chromium-6. In Missouri, as adopted from the EPA's standards, the Maximum Contaminant Level (MCL) for total chromium in the water is 100 ppb. However, we do not break down the chromium into chemical type

How did it get in Hannibal and Louisiana's water supply?

Trace amounts of hexavalent chromium are common. It's commonly used in the stainless steel process, as well as tanning processes. When the State of California studied the prevalence of hexavalent chrome in approximately 7,000 public drinking water sources, it found chromium-6 in 2,208 sources.

In the case of Hannibal and Louisiana's water, samples taken at the intake to the cities' municipal drinking water facilities had barely detectable amounts of hexavalent chrome in them (in fact, Louisiana's water tested as a "non-detect"). However, something is happening in the water treatment process that is raising the level of the level of chromium-6 in the finished water supplies.

Sampling by DNR staff of Hannibal's treatment process found that the hexavalent chromium levels stayed consistent at a level of 0.1 parts per billion (ppb) from intake until after the water passed through the plant's secondary settling basin, when it rose to 0.5 ppb. Levels rose 0.1 ppb after chlorination. DNR staff continue to work with federal, state and city officials to discover why the hexavalent chromium level increases after the secondary settling basin.

Is my water safe to drink?

Yes. The Missouri Department of Health and Senior Services and the U.S. Environmental Protection Agency have said there is no acute health risk in drinking the water. DHSS established a health-screening level – a conservative yardstick that helps regulatory agencies decide whether or not to continue investigating. DHSS' health-screening level for chronic exposure chromium-6 in drinking water is 0.4 ppb.

From DHS' letter to DNR regarding the health-screening level:

"...[S]creening levels do not identify health threats, per se, but ... further evaluation is needed."

An excerpt from a follow-on e-mail from DHSS to DNR, regarding the setting of the health-screening level:

From DHSS's e-mail:

"The highest concentration found in the samples taken from the water supplies was 0.401 ug/L, which rounds to 0.4 ug/L. This concentration does not exceed the current screening level."

"As a reminder, screening levels are set at concentrations low enough that people may be exposed to a contaminant at the screening level for many years without experiencing adverse health effects. It (sic) the concentration of a contaminant exceeds a screening level, it does not necessarily mean that people are at risk for adverse health effects, it merely means that the situation should be examined closer."

For some perspective, there are some water districts in California that regulate chromium-6 at 6.0 parts per billion.

Isn't hexavalent chromium the chemical Erin Brockovich brought to the media's attention?

Yes. Brockovich first brought hexavalent chrome to the mass media's attention in Hinkley, Calif., where she helped discover hexavalent chromium in the town's drinking water. In that city – which was made famous by Julia Roberts' role of Brockovich in the movie *Erin Brockovich* – chromium-6 levels were found at 580 ppb. In the summer of 2009, Brockovich announced that she had discovered chromium-6 at levels of 5,280 ppb in the drinking water of at least 40 homes in Midland, Texas.

What was the timeline for DNR's discovery of chromium-6 in Hannibal and Louisiana's drinking water?

Initial sampling was done at Hannibal and Louisiana on Dec. 17. The results were returned from an out-of-state lab (one of a handful in the country that can test for extremely low levels of chromium-6) on Dec. 22. None of the samples were above the DHSS-set health screening level

of 0.4 ppb, but there was a mystery: Why was the level of hexavalent chrome in the finished water higher than it was the raw water? Additional sampling was ordered to find out (of note: a sample that was split off from the original Dec. 17 sampling and sent to another lab failed quality assurance controls and was, thus, unusable, when received the following week). Officials in both Hannibal and Louisiana were contacted by Dec. 24, and conversations continued through the following week.

A second set of samples was drawn from Hannibal and Louisiana on Dec. 29. That set of samples was also unusable due to quality control issues. A third set of samples was drawn Jan. 5, with the results delivered Jan. 7. Those samples showed that Hannibal's finished drinking water had a hexavalent chromium level of 0.6 parts per billion in it, which put it above the DHSS-set health screening level.

At that time, DNR issued a news release.

Why were two sets of lab samples contaminated?

Testing for hexavalent chrome under a level of 1 ppb is difficult, highly technical and leaves no margin for error. In the case of the first set of contaminated samples, there was apparently contamination of the lab's testing equipment. In the case of the second set of samples, the lab-provided preservatives used to transport the water were contaminated.

Did BASF have a release of chromium-6? Are the higher levels of hexavalent chromium in Hannibal's and Louisiana's drinking water due to that release?

BASF performed an incinerator test on May 20, 2009, in which a sodium additive had an unforeseen and adverse reaction with the chromium-3 bricks that lined the incinerator's kiln. BASF's contract monitoring lab notified the facility on June 8 that there had been a release of approximately 5,100 ppb of hexavalent chromium. At that time, DNR staffs' professional judgment was that no public health threat existed.

Based upon DNR's findings when sampling each stage of Hannibal's water treatment process, it appears that the May 20 release is not related to the chromium-6 levels in Hannibal and Louisiana's water.

Is BASF allowed to discharge chromium-6? How many facilities in the state are allowed to discharge it?

BASF is not permitted to discharge hexavalent chrome. However, there are 62 facilities in the state that are permitted to discharge chromium-6. They are primarily landfills and water treatment facilities. You can see a map here <http://dnr.mo.gov/chromium/chromium-facilities-map.pdf>.

Is testing for chromium-6 expensive?

Yes. If DNR were to sample all 2,578 water supply wells and surface water sources just for chromium-6, it would cost approximately \$2.3 million.

For More Information

For more information about chromium, contact:

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