

June 21, 2011

FACT SHEET: Testing for Hexavalent Chromium in Water

Chromium (Cr) is a naturally occurring metal in both surface and ground water and exists in two different oxidation states: +3 (III) or +6 (VI). Although Cr (III) is an essential micronutrient for people, Cr (VI), or Hexavalent Cr (or “Hex Chrome”), is considered a carcinogen. Hexavalent chromium is used in many industrial applications (e.g. metal-plating), where very high concentrations may be present and pose health concerns related to potential exposures in these occupational settings. Most analytical methods for chromium do not distinguish between Cr (III) and Cr (VI), but provide measurements of TOTAL Cr (i.e. Cr (III) + Cr (VI)).

The EPA has established a Maximum Contaminant Level for total Cr of 100 ppb, which is based on a worst case scenario of 100% of the Cr being in the Cr (VI) form (i.e., measuring total Cr is basically a surrogate for analyzing Cr (VI)). Drinking water samples are consistently far below 100 ppb. In Madison tap water, concentrations of total Cr have been below 3 ppb for the past 4 years. The concentration of dissolved total Cr in water samples taken from the Great Lakes are in the range of <0.1 to 0.4 ppb with the large majority in the Cr (VI) form. Median levels of dissolved total chromium in tributaries to Lake Michigan range from 0.1 to 0.6 ppb. Concentrations of total Cr in Wisconsin ground waters are typically quite low (<0.02 to 0.2 ppb), though levels of 0.5-1 ppb are common in certain aquifers. For comparison, the Cr (VI) concentration in industrial contaminated groundwater, like that in Hinkley, CA made famous in the film “Erin Brokovich,” has been reported at 600 - 1500 ppb.

A new maximum level has been proposed by California for solely Cr (VI) at 0.02 ppb. This is currently in the proposal stage and being assessed by the EPA, state of CA and scientists.

The WI State Lab of Hygiene (WSLH) routinely measures total Cr in drinking water. The (WSLH) utilizes several methods that can measure total Cr employing either plasma mass spectrometry (EPA 1638/200.8); plasma optical emission spectrometry (EPA 200.7) or graphite furnace atomic absorption (EPA 1639/9191) with detection limits in the range of 0.2 – 1.0 ppb. The WSLH also operates a method specific for Hexavalent Cr (using USGS method I-1230-85); with a detection limit for Cr (VI) of 1 ppb.

To meet possible new standards, the WSLH now offers a Chromium (VI) panel for \$80 each. The kit includes a bottle for Total Cr and also a syringe, filter and SPE (solid phase extraction) cartridge to process the sample for Cr (VI) which is collected in a test tube. The processing method follows a USGS fact sheet (USGS FS-006-03) and is analyzed afterwards on an ICP-MS to provide lower detection limits (LOD for Cr (VI) = 0.02 ppb, total Cr = 0.004 ppb). We are also calculating the percentage of Cr (VI) to total Cr in samples to gain more information. Kits can be ordered from our customer service: (800) 442-4618 or (608) 224-6202. (Note: there are also contract labs throughout WI that can also test for Cr (VI) or total Cr).

Note: ppb = µg/L = microgram per liter

Links for further Cr information:

EPA:

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

Madison water utility:

<http://www.cityofmadison.com/water/documents/ChromiumTestingInMadison.pdf>