

Chromium in Drinking Water

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Drinking Water

[Analytical Methods and Laboratories](#)
[Consumer Information](#)
[Drinking Water Standards](#)
[Emergency Preparedness](#)
[Local Drinking Water Information](#)
[Private Wells](#)
[Virtual Tour of Water Treatment Plant](#)
[Water Contaminants](#)
[Water Security](#)
[Water on Tap: Consumer's Guide](#)

Education & Training

Grants & Funding

Laws & Regulations

Our Waters

Pollution Prevention and Control

Science & Technology

Water Infrastructure

What You Can Do

You are here: [Water](#) » [Drinking Water](#) » [Consumer Information](#) » [Chromium in Drinking Water](#) » EPA's recommendations for enhanced monitoring for Hexavalent Chromium (Chromium-6) in Drinking Water

EPA's recommendations for enhanced monitoring for Hexavalent Chromium (Chromium-6) in Drinking Water

[Chromium Home](#)
[Administrator's Statement](#)
[Guidance for Systems](#)
[Basic Information about Chromium in Drinking Water](#)

Ensuring safe drinking water for all is a top priority for EPA, state drinking water agencies, and drinking water systems across the country. National primary drinking water regulations set the maximum contaminant level (MCL) of 0.1 mg/L for total chromium, which includes chromium-6 (hexavalent chromium), and requires community and non-transient non-community water systems to test for chromium at the entry point to the distribution system. The chromium standard was established in 1991 based on the best available science.

EPA regularly re-evaluates drinking water standards; a rigorous and comprehensive review of chromium-6 health effects began following the release of the toxicity studies by the National Toxicology Program in 2008. In September, 2010, EPA released a draft of the scientific assessment ([Toxicological Review of Hexavalent Chromium](#)) for public comment and external peer review. When this human health assessment is finalized in 2011, EPA will carefully review the conclusions and consider all relevant information to determine if a new standard needs to be set.

In the interim period, EPA is providing the following guidance to water systems on how they may monitor for chromium-6 in addition to the monitoring they are required to perform for total chromium. EPA believes that the enhanced monitoring will enable public water systems (PWSs) to: better inform their consumers about the levels of chromium-6 in their drinking water, evaluate the degree to which other forms of chromium are transformed into chromium-6 in their drinking water and assess the degree to which existing treatment is affecting the levels of chromium-6.

- [Pete Silva's Memo to Drinking Water Systems PDF](#) (2pp, 28K) New!
- [EPA Press Release](#)

Should my water system conduct enhanced monitoring for Chromium-6?

Given the emerging public health information, EPA is providing this guidance to all public water systems to show how a system could enhance chromium monitoring through additional sampling and analysis specifically for chromium-6. The Agency strongly encourages water systems to consider the following recommendations and to determine how your system might enhance drinking water monitoring for chromium-6.

Where should water systems collect samples?

Chromium is complex in its behavior in drinking water systems as it may occur in water systems in both the chromium-3 (trivalent chromium) and chromium-6 forms. Under distribution system conditions, e.g., in the presence of an oxidant such as chlorine, chromium-3 can be transformed into the more toxic chromium-6 form. Existing treatment processes such as conventional treatment may be effective in removing chromium-3, but not chromium-6. To understand the fate of incoming chromium-6 in raw water supplies or transformed chromium-6 from chromium-3 following conventional treatment and disinfection, EPA recommends that systems collect samples at the locations listed below.

Intake/well locations: EPA recommends that water systems collect samples of untreated water at the intake/well. Systems with multiple intakes/wells should identify sampling points that result in a representative sample of the utilized source waters to account for the multiple sources, seasonal variation in sources and historical measured total chromium concentrations at entry points to the distribution system. Chromium data at entry points can serve as a guide for identifying the corresponding source water intakes/wells, which should preferably be targeted for monitoring.

Entry points to the distribution system: EPA recommends that systems with drinking water treatment processes also collect samples at the point that treated water enters the distribution system. Systems with multiple entry points should collect samples from representative entry points to the distribution system. The actual number of entry points may depend on the number of treatment plants and historical total chromium concentrations in the treated water.

Distribution System: EPA recommends that systems collect representative samples from locations within the distribution systems. Since chromium-3 can transform into chromium-6 in the distribution system due to the presence of an oxidant such as chlorine, it is desirable that systems monitor for chromium-6 at locations considered to represent the maximum

residence time, which is consistent with the monitoring goals for disinfection byproducts. The number of locations to consider for sampling within the distribution system will depend on the number of entry points, the relational proximity of entry points and the overall size of the distribution system. EPA also recommends that systems collect samples at a subset of 10 or fewer distribution system locations where they currently sample under the Disinfection By-products Rule (DBP) Stage 1 and 2, and that systems not disinfecting consider collecting samples from a subset of 10 or fewer locations where they typically sample under the Total Coliform Rule (TCR).

How frequently should samples be collected?

EPA recommends that water systems with surface water sources collect samples quarterly to capture the variation that may occur in the levels of chromium-6 in source waters. EPA recommends that ground water systems be sampled semi-annually. EPA recommends that systems collect samples from each of the locations listed above on the same day.

How can I find a laboratory to measure chromium-6?

EPA recommends the following steps for monitoring specifically for chromium-6. Public water systems should contact a drinking water laboratory they typically use for compliance monitoring and request sample analysis using a modified version of EPA Method 218.6, "Determination of Dissolved Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography" (Rev. 3.3, 1994; www.nemi.gov). These modifications allow for improved low concentration measurement and are outlined in Dionex Corp. Application Update 144 "Determination of Hexavalent Chromium in Drinking Water by Ion Chromatography" found at www.dionex.com/en-us/webdocs/4242-AU144_V18.pdf. With these modifications, laboratories are capable of attaining a detection limit as low as 0.02 µg/L (ppb) and can support a reporting limit of 0.06 µg/L (ppb). Any equivalent ion chromatographic system from any manufacturer with comparable hardware that can generate this performance and meet the quality control requirements of EPA Method 218.6 may also be used. Links to non-EPA sites do not imply any official EPA endorsement of, or responsibility for, the opinions, ideas, data or products presented at those locations, or guarantee the validity of the information provided. Links to non-EPA servers are provided solely as a pointer to information on topics related to environmental protection that may be useful to EPA staff and the public.

The analytical instrumentation required for EPA Method 218.6 is not uncommon in drinking water laboratories: however, many laboratories may not be "set-up" to offer this analysis. Laboratories that have the necessary equipment and are certified by an accrediting authority to conduct an approved ion chromatography method (e.g., EPA Method 300.0, SM 4110B, ASTM D4327) should be given preferential consideration to provide this analytical support. If your PWS is having difficulty finding a laboratory that offers this analysis, there are several state certified labs in California to support the State's chromium-6 drinking water monitoring requirement and these are posted at www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx. [See the Procedures and Lists heading.] Those laboratories in the downloaded spreadsheet that are marked under "FOT 103" (field of testing 103) can be contacted and asked if they are certified for CA CDPH subgroup code 103.310, which is specific to EPA Method 218.6 for chromium-6. EPA is in the process of contacting drinking water laboratories across the country in an effort to further establish national drinking water laboratory capacity.

If your laboratory has interest in providing the analytical support for this enhanced monitoring, EPA encourages the lab organization to review the requirements of modified Method 218.6. To address concerns regarding the sample holding time of 24 hours specified in EPA Method 218.6, EPA reviewed published literature and recent laboratory sample holding time studies for drinking waters. The holding time of 24 hours prescribed in Method 218.6 was based upon the most conservative holding times for wastewater and sludge extracts, also covered by the method, and not the stability of chromium-6 in drinking water matrices. Consequently, EPA is temporarily recommending an extension of the maximum holding time for properly collected and buffered drinking water samples from 24 hours to 5 days following sample collection.

Who should I call if I have questions about EPA's recommended enhanced monitoring for chromium-6?

Contact EPA via email at the [Safe Drinking Water Hotline website](#) or call the Safe Drinking Water Hotline at 1-800-426-4791 (Monday through Friday, 10:00 am to 4:00 pm eastern time)



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