Steps Water Systems Can Take to Address Perchlorate in Drinking Water

Perchlorate is commonly used in solid rocket propellants, munitions, fireworks, airbag initiators for vehicles, matches, and signal flares. Perchlorate may occur naturally, particularly in arid regions such as the southwestern U.S. and can be found as a byproduct in hypochlorite solutions used for treating drinking water and nitrate salts used to produce fertilizers, explosives, and other products.

At certain levels, perchlorate can prevent the thyroid gland from getting enough iodine, which can affect thyroid hormone production. For pregnant women with low iodine levels, sufficient changes in thyroid hormone levels may cause changes in the child's brain development. For infants, changes to thyroid hormone function can also impact brain development.

This document is intended for water systems that may be concerned about perchlorate in their drinking water. EPA estimates that very few water systems currently have perchlorate in drinking water at levels of health concern. Since 2011, EPA has found that perchlorate levels in drinking water supplies have declined due to actions taken by EPA, states and local communities including reducing sources of perchlorate contamination and improved water system operations. Additional information can be found in the "Reductions of Perchlorate in Drinking Water: Status May 2020" report (EPA-815-F-20-002).

OFFICE OF GROUND WATER AND DRINKING WATER

EPA does not regulate perchlorate in drinking water. If you are concerned about perchlorate in drinking water, consider taking the following steps.

1. Test Your Drinking Water

The only way to know if you have perchlorate in your drinking water is to test the water.

- Work with a laboratory that can analyze perchlorate in drinking water.
- There are several EPA-approved analytical methods for perchlorate (EPA Method 314.0, 314.1, 314.2, 331.0, and 332.0), and costs can vary between $55 and $175 per sample for laboratory analysis.
- The laboratory typically provides instructions for collecting the sample based upon the method it will use to measure the concentration of perchlorate in drinking water.

2. Review the Results

- Once you receive results from the lab, compare the measured concentration in your drinking water to your state's guidance, action, or advisory level (see table below) to inform decision-making.
- If your state does not have an advisory level, you may consider using the EPA's Perchlorate Interim Health Advisory as a basis of comparison.

State	Level (µg/L)	Description
State Drinking Water Standards		
California	6	Existing Maximum Contaminant Level (MCL)*
Massachusetts	2	Existing MCL*
State Drinking Water Guidance, Action, or Advisory Levels		
Arizona	14	Health-based guidance level (AZ DHS, 2005)
Hawaii	15	Action level for drinking water (HI DOH, 2017)
Maine	0.8	Maximum Exposure Guidelines (MEG) for Drinking Water (ME DHHS, 2016)
Maryland	1	Advisory Level (ASTSWMO, 2011; Harford County Government, 2017)
Nevada	18	Provisional action level based upon EPA guidance (NDEP, 2012)
New Jersey	5	Ground Water Quality Standard (NJ DEP, 2018)
New Mexico	13.8	Tap water screening level (NMED, 2019)
New York	18	State Guidance Level (NY DOH, 2018)
Oregon	4	Recommended Action Level (OR DHS, 2004)
Vermont	2.2	State Health Advisory (VT DOH, 2019)

* If a sample exceeds the MCL, water systems must quickly take a follow up sample to determine compliance. In California, the follow up sample must be collected within 48 hours and in Massachusetts within 24 hours.

3. Reduce the Level of Perchlorate in Drinking Water

Water systems with levels of perchlorate of concern in their finished drinking water may consider taking actions to reduce their consumers' exposure to perchlorate.

Treatment

Water systems may choose to install and operate treatment systems that have demonstrated effective removal or destruction of perchlorate in drinking water. The following treatment technologies have been demonstrated to be effective at reducing levels of perchlorate in drinking water. For more

information regarding treatment technologies for perchlorate go to: https://iaspub.epa.gov/tdb/pages/contaminant/contaminantOverview.do?contaminantId=1176389556.

Treatment options include:

- **Anion exchange**: Water is passed through a bed of synthetic resin in which negatively charged contaminants such as perchlorate are exchanged with more innocuous negatively charged ions, typically chloride, on the resin's surface. When exchange sites on the resin are exhausted, perchlorate-contaminated waste products (either the resin or the regeneration wastes) must be disposed of in accordance with applicable standards.
- **Biological treatment**: Water flows through a bioreactor basin in which bacteria are developed that remove perchlorate by reducing perchlorate ultimately to chloride and oxygen. This process offers complete destruction of the perchlorate ion, eliminating perchlorate-contaminated waste products.
- **Reverse osmosis**: This process forces water at high pressure through membranes that prevent the passage of substances with higher molecular weight including perchlorate. The concentrate or reject water that cannot pass through the membrane must be disposed of in accordance with applicable regulations.
- **Point-of-use (POU) and Point of Entry (POE) reverse osmosis**: These are household devices that use the reverse osmosis treatment process. The devices can be installed on a single tap or whole house to remove perchlorate from water used for drinking or cooking. Consider selecting a POU device that is certified against ANSI-NSF standards.

Storage and Handling

Water systems may also be able to reduce perchlorate levels through changes in their handling and storage of hypochlorite solutions. These solutions are common disinfectants used for drinking water. However, if improperly stored, perchlorate can form in the solution. The American Water Works Association has developed best practices Standard B300-99, which provides recommendations for how water systems can minimize perchlorate formation in hypochlorite solutions.[1]

Water systems may use the EPA's work breakdown structure (WBS) models to estimate the costs of installation and operation and maintenance of perchlorate treatment technologies. Each WBS engineering model contains a work breakdown for a particular treatment technology process. For more information go to: https://www.epa.gov/dwregdev/drinking-water-treatment-technology-unit-cost-models-and-overview-technologies.

Non-Treatment

Water systems may also consider options other than treatment to reduce perchlorate levels. Non-treatment options include:

- Mixing water from the contaminated source with an uncontaminated source to reduce the concentration of perchlorate in the blended water.
- Removing the water source that is contaminated and using other existing uncontaminated sources. This is an option for water systems that use multiple water sources.
- Removing the water source that is contaminated and using a new water source (e.g., a new well) that is uncontaminated.
- Purchasing water from a nearby water system with excess capacity.

[1] https://www.awwa.org/Publications/Standards/Standards-List

4. Communicate with your Customers

If you are testing your drinking water for perchlorate, the EPA recommends that you communicate the results and other information to customers. Consumers will likely want to know:

- Should I be concerned about the levels of perchlorate in my water?
- What are the health effects of perchlorate?
- Who is most at risk?
- What steps has the water system taken to address perchlorate?
- Should an alternative source of drinking water be used?
- What actions should consumers take to protect themselves and their family?

Inform customers on when and how you are testing for perchlorate. The EPA recommends that you provide customers with perchlorate test results in a timely manner so that they know if they are at risk and can plan accordingly. Help customers understand their risk by explaining results in simple terms, using visuals when appropriate, and providing a frame of reference, such as a state's guidance, action, or advisory level and information about the health effects of perchlorate and at-risk populations. Below is an example of a health risk statement for perchlorate:

> *At certain levels, perchlorate can prevent the thyroid gland from getting enough iodine, which can affect thyroid hormone production. For pregnant women with low iodine levels, sufficient changes in thyroid hormone levels may cause changes in the child's brain development. For infants, changes to thyroid hormone function can also impact brain development.*

The EPA recommends that you clearly explain the steps the water system has taken or plans to take to address perchlorate in its drinking water, including possible future actions and their associated timeframe for completion. You should also provide information about actions consumers can take to avoid perchlorate-contaminated water. For example, using bottled water or installing a point-of-use reverse osmosis system. Pregnant women and parents of infants that are concerned about perchlorate in drinking water should talk to their doctor about getting sufficient dietary iodine.

When communicating with your customer about their risk of perchlorate exposure, it is important to acknowledge their concerns. Foster trust and credibility by conveying uncertainty with honesty; do not underestimate your customers' risk or provide false reassurance. Also, when communicating with your consumers, EPA recommends that you keep the following principles in mind:

- Involve your customers as your partners.
- Plan carefully and evaluate your efforts.
- Listen to the specific concerns from your customers.
- Be honest, frank and open.
- Be concrete about what you are doing.
- Coordinate and collaborate with other credible sources.
- Communicate clearly.
- Consider using the Safe Drinking Water Act Public Notification Templates to identify potential message content, formatting, and delivery.
- Follow effective risk communication practices outlined in EPA guidance such as Risk and Crisis Communication during Water Security Emergencies and Risk Communication in Action: A Risk Communication Workbook.

For more information visit: www.epa.gov/safewater