

## ← TTHM and HAA5 in Drinking Water FAQ and Fact Sheet



# Disinfection Byproducts in Drinking Water: Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5)

## Information for consumers and water providers

### General Facts

- Disinfection byproducts (DBPs) are compounds that form when a disinfectant such as chlorine is added to drinking water and reacts with naturally occurring organic matter, such as decaying leaves or plants, in the water.
- In Colorado, public water systems add disinfectants to drinking water to kill harmful organisms that may be present in the water. Adding disinfectants helps to prevent water-related illnesses. The most common disinfectants used are chlorine and chloramine.
- There are many different DBPs that can form in drinking water depending on the water quality and the type of disinfectant used. The two most common groups of DBPs formed in chlorinated water are total trihalomethanes (TTHM) and haloacetic acids (HAA5).
  - TTHM and HAA5 usually occur at higher levels in drinking water than other DBPs. If TTHM and/or HAA5 are present in drinking water, it may indicate other DBPs are present in the water as well.
- Groundwater supplies, such as wells, typically have low levels of DBPs because there is less naturally occurring organic matter present. Surface water supplies, such as lakes and rivers, can have higher DBP levels because they typically contain more naturally occurring organic matter.

### Standards and requirements for public water systems

- The U.S. Environmental Protection Agency (EPA) set the maximum contaminant levels (MCL) for TTHM and HAA5 with the goal of protecting human health. The MCL is the maximum level allowed of a contaminant in drinking water which is delivered to any user of a regulated public water system.
- The Colorado Department of Public Health (CDPHE) enforces the following federal drinking water TTHM and HAA5 maximum contaminant levels set by the EPA:
  - Total trihalomethanes (TTHM): 0.080 milligrams per liter (mg/L)
  - Haloacetic acids (HAA5): 0.060 milligrams per liter (mg/L)
- All community water systems (such as cities, towns, and homeowner associations) and non-transient non-community water systems (such as schools and businesses) test their drinking water for TTHM and HAA5.
  - All drinking water testing must be conducted by a certified laboratory.

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- If the yearly average of contaminant levels (also referred as a “running annual average”) for a sample location is above 0.080 mg/L for TTHM or 0.060 mg/L for HAA5, then the water system is in violation of drinking water regulations and they have to notify their consumers.
  - If a public water system continues to exceed the drinking water maximum contaminant levels for TTHM or HAA5, the system must take corrective actions. This is an important step to protect health.
    - Corrective actions can include removing natural organic material from the water, using a different disinfectant, changing the disinfection dose or location, or flushing water in the distribution system.
    - The system must also conduct public notice, which must include what the system is doing to address the situation and what precautions, if any, consumers should take.
- If the water system continues to exceed the maximum contaminant levels for TTHM or HAA5, CDPHE will order the water system to meet the regulations. The enforcement order process will provide a path back to compliance.

### Health effects of TTHM and HAA5 in drinking water

- Some people who drink water containing TTHM above the maximum contaminant level (MCL) over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer. Some people who drink water containing HAA5 above the MCL over many years may have an increased risk of getting cancer.
- Information on the health effects for many DBP compounds is limited. There is still some uncertainty regarding the health impacts of TTHM and HAA5 in humans.
- Disinfection of drinking water is one of the major public health advances over the last century. Disinfectants such as chlorine kill or inactivate harmful organisms that cause illness and disease. A balance of public health protections must be maintained to reduce the risk of waterborne disease through disinfection, while preventing or reducing the chances of health effects occurring due to DBPs in drinking water.

### Recommendations to protect public health

- **Talk to your doctor.** Whether a contaminant will harm your health depends on many factors. These factors include amount of exposure, age, genetics, and health history. If you or your family are concerned about your health or have symptoms you think are caused by disinfection byproducts, discuss your concerns with a health care provider.
- **Your water provider will notify you if you need to stop drinking your water. If you have not been instructed to do so, but are still concerned, consider:**
  - Using bottled water.
  - Purchasing a water treatment system, such as aeration, carbon filtration, or reverse osmosis. You should verify the product has been independently certified to reduce TTHM and/or HAA5, and maintain the treatment according to the manufacturer’s specifications.
    - The NSF provides information on its [website](#) that allows consumers to identify the right water treatment solution. Since the risks for TTHM and HAA5 are primarily related to ingestion and drinking, an under-the-sink filter at a kitchen faucet should be adequate.
  - In-home water treatment systems generally must be installed by the homeowner, a licensed plumber, or a certified water softener installer. Check with [local government](#) to see if you need a permit to perform the work. Licensed or certified installers are regulated by the Colorado Department of Regulatory Agencies - State Plumbing Board.

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### Recommendations for public water systems

- CDPHE recommends that any system with elevated levels of TTHM and/or HAA5 consult with a Professional Engineer licensed in the state of Colorado. For community water systems, any treatment modifications must be designed by a Professional Engineer. Any modifications to waterworks will generally require prior design approval from the department.
- The following processes are considered effective for the reduction of TTHM and HAA5:
  - Treatment or distribution system changes to minimize the formation of disinfection byproducts including, but not limited to:
    - Removal of organic material from the source water,
    - Modifications to disinfection dose and/or type, and
    - Adjustments to distribution system management such as implementing a flushing program and managing water age in storage tanks.
  - Removal of already-formed disinfection byproducts using treatment such as reverse osmosis.
  - Using corrective approaches such as reducing naturally occurring organic materials from the source water before interaction with the disinfectant is often easier and more cost effective than removing disinfection by-products after they are formed.
- Select appropriate TTHM and HAA5 sample sites:
  - High TTHM sites are typically where the water is oldest and chlorine residual is lowest.
  - High HAA5 sites are typically near the ends of the distribution system where the chlorine residual is low, but above 0.2 mg/L, or at mixing zones.
  - Most systems with the option to sample both TTHM and HAA5 at one location or separately at two locations will probably find sampling at one location is justified. This is because high TTHM and high HAA5 levels are usually at the same location, based on the size and configuration of their water system.
  - High TTHM and HAA5 levels often coincide with high water age. Do not sample from sites at dead ends or that have low/no water usage.

### Questions and answers

#### ● **Is it harmful to drink water with DBPs above the maximum contaminant levels?**

It depends on the concentration of DBPs in the water. In general, drinking water with DBPs above the maximum contaminant level for a short period of time will not significantly increase the chances of health problems. Disinfectants kill harmful organisms in the water to prevent water-related illnesses. It is much riskier to drink water that has not been treated with disinfectants.

#### ● **Are there any groups of people who should not drink the water?**

Infants, immunocompromised people, older adults, and pregnant people may be at greater risk for health problems. These groups should seek advice from their health care provider on whether to take steps to reduce DBP exposure until levels decrease.

#### ● **How would I know if the water is not safe to drink?**

Your public water supplier will notify you if the water is not safe to drink. They will provide you with next steps if applicable.

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described in the “Recommendations to protect public health” section above.

- **Is it OK to use the water for other purposes, such as brushing teeth, washing dishes, feeding my pet, etc.?**

Yes. If you have not been instructed otherwise by your public water supplier, it's OK to use the water for other purposes. Water with DBP levels above the maximum contaminant levels may be safely used for general cleaning, washing dishes, cooking, drinking, bathing, and brushing teeth for short periods of time.

The health problems animals experience from DBPs may be similar to the health problems people experience, but information about the risk to animals is limited. Contact your veterinarian to determine if you should provide alternative drinking water for your animals.

- **How long would a person have to drink water above the maximum contaminant levels to start to show negative effects?**

A long time, over many years. Age, gender, genetics, lifestyle, and other factors also play a role in how exposure to DBPs impacts someone's health. This video explains more: <https://cdphe.colorado.gov/environment-and-your-health>.

- **I still have health-related questions.**

We encourage people to contact their health care provider if they are concerned. If you do not have a health care provider, you can contact ToxCall at 303-692-2606 or [cdphe\\_toxcall@state.co.us](mailto:cdphe_toxcall@state.co.us). We cannot provide medical advice, but we can connect you to more information.

- **I still have drinking water-related questions.**

Please contact CDPHE's Drinking Water Compliance Assurance Section at 303-692-3556.