Massachusetts Department of Environmental Protection

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# Haloacetic Acids and Total Trihalomethane In Drinking Water Information for Consumers


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## Disinfection Byproducts (DBP): What Are HAA5 and TTHM?

Haloacetic acids (HAA) and trihalomethanes (THM) are two groups of disinfection byproducts (DBP) that form when water disinfectants such as chlorine or ozone react with other naturally occurring chemicals in the water.

There are five significant regulated HAA potentially found in disinfected drinking water. Their combined concentration is referred to as HAA5.

There are four significant regulated THM compounds potentially found in disinfected drinking water and their combined concentration is referred to as total THM (TTHM).

Levels of DBP can be affected by seasonal changes in source water quality or by changing amounts of disinfectant added. Water systems often can experience temporary increases in DBP due to short-term increases in disinfectants which can occur when there is a water main break, water systems are under repair, or there is a potential microbial (example: bacteria) problem or threat.

All water systems that disinfect their water with chlorine or ozone are required by federal and state law to sample for HAA5 and TTHM on a regular basis (quarterly, or once every three months).

## Why are Disinfectants Added?

Disinfection of water supplies with chlorine or ozone is necessary to prevent illness. This practice has nearly eliminated most acute waterborne diseases in the United States. Reducing the levels of DBP while maintaining effective disinfection of the water is challenging and may require several process and treatment modifications that take time to install and get working effectively. Stopping disinfection is not an option as the risk of illness from drinking untreated surface water and many groundwaters is often greater than the risks from the byproducts.

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## What Are the Drinking Water Standards for HAA5 and TTHM and How Is Compliance Determined?

Drinking water standards are called maximum contaminant levels (MCL). They are set at levels to protect against the long-term risk of potential adverse health effects and to limit the possibility of bacterial contamination.

The US EPA and MassDEP have set MCLs for HAA5 and TTHM of 60 ug/L[1] (also referred to as parts per billion, ppb) and 80 ug/L respectively as annual averages. The running annual average of four samples (i.e., quarterly, or once every three months over a year) must not exceed each respective MCL at each sampling location.

## How Can Consumers Be Exposed to HAA5 and TTHM in Drinking Water?

Drinking water is the main source of exposure to HAA5 and TTHM followed by ingestion of it in foods and/or ice prepared with the water.

It is possible that small amounts of HAA5 could be absorbed through the skin during handwashing and showering. Significant inhalation exposures of HAA5 chemicals during handwashing or showering does not occur as these chemicals do not readily vaporize into the air.

TTHM vaporize readily into the air so inhalation exposure to TTHM and absorption through the skin can be significant, especially when showering and bathing.

## What Are the Health Risks Associated with Using Water Containing HAA5 and TTHM?

HAA5 and TTHM are possibly carcinogenic to humans based on evidence of carcinogenicity in laboratory animals and limited evidence in people.

[1] µg/L = mg/L / 1000

Other effects have been reported in experimental animals exposed to high levels of HAA5 and TTHM. These include effects on the liver, kidneys, and reproductive system for both groups. Effects on development have also been reported for HAA5 and on neurological systems for TTHM.

The significance of these effects is uncertain as some studies of people have reported similar effects while others have not. Scientists are working to address these differences.

Pregnant women or those who may become pregnant may be more susceptible to effects from chemicals such as those in the HAA5 or TTHM groups. Children (including infants) are generally considered more sensitive to the effects of chemicals in these groups than others in the general population and typically also consume more water for their size than adults[2].

The degree of risk for these effects will depend on the DBP levels and the duration of exposure. Consumption of water with HAA5 and TTHM levels somewhat above their respective MCLs for limited durations, for example, while corrective actions are being taken to lower the levels, is not likely to significantly increase risks of adverse health effects for most people.

## What Should Mothers Who Are Breastfeeding Infants Know?

Breast milk can also be a source of HAA5 and TTHM exposure for infants, however, those infants will benefit from any exposure reductions experienced by the mother, and they also gain a substantial health benefit from breastfeeding. The Centers for Disease Control and Prevention recommend that nursing mothers continue to breastfeed their babies because of the numerous protective health benefits despite the potential presence of environmental contaminants.

## If You Are Concerned and Would Like to Reduce Exposures to HAA5 and TTHM, What Can You Do?

Women who are pregnant or may become pregnant and anyone concerned with exposure (including parents of young children) can avoid consuming water containing HAA5 and TTHM exceeding their respective drinking water standards. One option is bottled water.

An effective way to reduce exposures is to also use bottled water for preparing formula, beverages, or food that retains water (e.g., hot cereals, rice, or pasta). This approach also lessens the exposure for bottle-fed infants.

[2] https://www.mass.gov/guides/drinking-water-standards-and-guidelines

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For TTHM, water can be left overnight in a pitcher to allow the TTHM chemicals to leave the water. Most TTHM are volatile and will easily evaporate from the water at room temperature.
Exposures to TTHM can also be reduced by:

- Ventilating the bathroom when bathing or showering
- Reducing the length of showers and baths
- Operating room exhaust fans or ventilating room (open window) when boiling water, washing with hot water, or running the dishwasher
- Reducing the temperature on hot water heaters
- Limiting time spent in or around chlorinated pools or hot tubs

Bottled water sold in Massachusetts must meet all federal drinking water quality standards and, if originating in Massachusetts, must also meet state drinking water quality requirements.

Another option for reducing exposures to TTHM in drinking water is to use a home filter. Various types of home water filters, including reverse osmosis and granular activated carbon treatment technologies, will reduce exposure to TTHM. For consumers who choose to use a home treatment device, it is very important to follow the operation and maintenance specifications carefully to make sure that the device works as intended. For additional general information on home water treatment devices, please refer to: https://www.mass.gov/info-details/home-water-treatment-devices-point-of-entry-and-point-of-use-drinking-water-treatment

There are currently no known water filters that are certified to reduce or remove HAA5.

## Where Can I Get Additional Information?

If you have questions about your water system's operation, water quality monitoring, or water quality, please contact the system operator directly. If you have questions about the drinking water regulations or health risks posed by these contaminants[3], you can contact the MassDEP Drinking Water Program at: program.director-dwp@mass.gov. If you have questions about specific symptoms, you can contact your doctor or other health care provider. If you have general questions about your health, you can contact the Massachusetts Department of Public Health at 617-624-5757.

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[3] https://www.mass.gov/doc/supporting-documentation-for-drinking-water-standards-and-guidelines/download