Drinking Water Facts:

Disinfection By-Products

Introduction

A major accomplishment in public health during the past century has been the disinfection of public drinking water supplies. The disinfection of water to kill harmful microorganisms has greatly reduced serious illnesses and deaths associated with many waterborne diseases, such as cholera and typhoid. However, chemical disinfection leads to the formation of disinfection by-products (DBPs). Since the identification of DBPs in drinking water in the 1970s, many steps have been taken to reduce levels of harmful DBPs in drinking water.

What are disinfection by-products?

- **DBPs** are chemicals that form when disinfectants react with organic matter such as algae and decaying plants and leaves and other materials naturally present in drinking water.
- The most common types of disinfectants include chlorine, ozone, chlorine dioxide and chloramines. Each type of disinfectant forms different types of DBPs.
- The two most common classes of DBPs are **trihalomethanes (THMs)** and **haloacetic acids (HAAs)** formed in chlorinated drinking water. These can also form at lower levels with other types of disinfectants.

How can I be exposed to DBPs?

- **By drinking tap water:** Ingestion of chlorinated drinking water is the most common exposure route.
- **Inhalation:** Some DBPs can evaporate or "volatilize" into the air in your home when you are taking a shower or washing dishes. The hotter the water the more likely it is that DBPs will be released into the air.
- **Dermal:** Only very small amounts of DBPs get into the body through the skin and is not a significant risk of exposure.

Which DBPs have drinking water regulations in public water?

The United States Environmental Protection Agency (USEPA) regulates the following DBPs:

- **Total trihalomethanes (TTHMs)** which is the sum of four compounds: chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
- The five most common HAAs are referred to as **HAA5** and include chloroacetic acid, bromoacetic acid, dichloroacetic acid, dibromoacetic acid, trichloroacetic acid.
- **Bromate** is formed primarily during ozone disinfection.
- **Chlorite** is formed with chlorine dioxide disinfection.

Are DBPs harmful to my health?

Some people who drink water containing TTHM in excess of 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 in excess of the MCL over many years may have an increased risk of getting cancer. Information on health effects for many DBPs compounds are limited or unavailable.

Is there a safe level of DBPs in my drinking water?

In order to prevent or reduce the chances of health effects occurring due to contaminants in drinking water "Maximum Contaminant Levels" (MCLs) have been established by the USEPA and the New Jersey Department of Environmental Protection (NJDEP). MCLs are legal limits that public water systems must meet.

The following table provides the MCLs for the regulated DBPs. Water systems monitor for these DBPs each quarter based on a running annual average. Additionally, to reduce DBPs, water systems are required to reduce the amount of organic materials, measured as total organic carbon.

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MCLs	
TTHMs	80 µg/L
HAA5	60 µg/L
Bromate	10 µg/L
Chlorite	1,000 µg/L

Are DBPs present in my drinking water?

Your public water supplier is required to test for regulated DBPs in your drinking water and are required to send information about the quality of their water to customers each year. You can find out the results of these tests by contacting your drinking water supplier.

Monitoring results are also available from NJDEP at Drinking Water Watch. You can also find which community water system serves your town at NJDEP Data Miner. See Resources for more information.

What should I do if DBP levels in my drinking water are elevated?

If the MCL is exceeded, the water provider must lower the levels to below the MCL within a time period sufficient to protect your health. Your water supplier can describe steps they are taking to lower DBPs in your drinking water.

If you are concerned about DBP levels in your drinking water, there are additional steps you can consider to reduce exposure to DBPs.

What additional steps can I take to reduce exposure to DBPs?

- **Water filters:** NSF International, a non-profit organization, certifies drinking water treatment devices for removal of some DBPs.
- **Bottled water:** In New Jersey, bottled water companies are required to test the water regularly to make sure it meets standards and to identify the source of the water on the product label. Bottled water usage will not reduce your exposure to volatile DBPs that get into the air when you use your tap water for non-drinking purposes.

Additional steps continued...

- **Provide adequate ventilation**: Volatile DBPs can build up in the air in your home, especially in an enclosed area. Open windows or vent air to the outside during and after water use and spend less time in the bathroom after the water has been used.
- **Use less water:** Take shorter showers and baths to minimize exposure to volatilized DBPs.
- **Use cooler water**: Volatile DBPs are more likely to get into the air in your home when the water is hot.

Can private well water contain DBPs?

Private well water is often sourced from groundwater, which is unlikely to contain the organic material needed to form DBPs. DBPs can be present in private well water from the following:

- **If chlorine is added:** Flush out your well after if chlorine is added to kill harmful bacteria or following installation or repair work. If the chlorine is not properly flushed out of the system, DBPs can form in well water if organic material is present.
- **From a septic system:** DBPs can form in household septic systems when organic material reacts with chlorine-based cleaning products. Water discharged from the septic system can enter into the underground water supply and nearby wells.
- **From a leaking in-ground pool:** Chlorine can get into groundwater from leaking in-ground swimming pools. DBPs can form in the underground water supply when chlorine reacts with organic material discharges from a nearby septic system and can enter a nearby well.

Resources

- **NJ Department of Environmental Protection (NJDEP)**:
  - Drinking Water Watch: https://www9.state.nj.us/DEP_WaterWatch_public/
  - DEP DataMiner: https://www13.state.nj.us/DataMiner Search by Category > Water Supply and Geoscience
- **NSF International:**
  - http://info.nsf.org/Certified/DWTU/