Question and Answer Sheet

Disinfection Byproducts: Chlorination of Drinking Water

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What are byproducts from chlorine disinfection and how do they form?

Water systems add chlorine to drinking water to kill or inactivate harmful organisms in a process called "disinfection." During this process, chlorine also reacts with naturally occurring organic matter that may be present in drinking water. Chlorine disinfection byproducts (DBPs) can form during this chemical reaction.

What are the regulations on DBPs?

The Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules require water systems that use a disinfectant to monitor for two groups of DBPs. The U.S. Environmental Protection Agency (EPA) determined that regulating these two groups of DBPs would cause a general overall reduction in all DBPs. Other regulations apply to other less commonly used disinfectants, such as chlorine dioxide and ozone.

Total Trihalomethanes (TTHM): The maximum contaminant level for TTHM is 0.080 mg/L.

Haloacetic acids (HAA5): The maximum contaminant level for HAA5 is 0.060 mg/L.

At present, EPA is reexamining TTHM and HAA5 regulations based on new information regarding these contaminants.

Do DBPs have harmful health effects?

According to EPA, some people who drink water containing TTHM or HAA5 in excess of the established MCLs over many years may experience problems with their liver, kidneys, or central nervous system and may have an increased risk of getting cancer. At present, however, there is no conclusive evidence linking DBPs in water with cancer or other health effects.

Do the benefits of chlorination outweigh the health risks of DBPs?

The simple answer is yes. Adding chlorine to drinking water sources with bacteria and other harmful organisms makes the water safer to drink. When used correctly, chlorine kills or inactivates harmful microorganisms that cause diseases, such as *E.coli* infection, typhoid, cholera and dysentery.

Is chlorination the best disinfectant for my water system?

The immense benefits of reducing infectious diseases, and the simplicity and low cost of water treatment using chlorine, makes chlorination the most appropriate disinfectant for most water systems.

What determines the concentration of DBPs for a water system?

The amount of naturally occurring organic matter in your source water largely determines your DBP levels. However, the water system design and the way a system operates it can also affect the DBP level. Groundwater systems usually have very low levels of naturally occurring organic matter, so the level of DBPs formed in the water is low. Surface water systems often have more naturally occurring organic matter and can have higher DBPs.

What can a water system do to reduce the amount of DBPs formed?

Many water systems may be able to reduce the amount of DBPs formed without reducing public health protection by using one or more of the following methods:

- Remove or reduce the organic substances that react with the chlorine to produce DBPs.
- Reduce the contact time and/or the concentration of chlorine in the distribution system.
- Ensure adequate turnover in storage tanks and eliminate areas of stagnant water.
- Reduce the "water age" (the length of time water is in the distribution system).
- Change the location where they add chlorine or add booster chlorination.
- Use a different type of disinfectant.

Are there alternatives to chlorine?

Yes. Disinfectants other than chlorine have certain advantages and disadvantages and some form other types of DBPs. The ability to implement alternatives depends on the water quality history and resources available to your water system.

Alternatives to chlorine include:

- Chloramines.
- Chlorine dioxide.
- Ozone.
- Ultraviolet Radiation (UV).

For more information

Our publications are online at doh.wa.gov/drinkingwater. You may also read the following fact sheets.

Alternate Disinfectants (331-252)

Chlorination of Drinking Water (331-253)

Regulating Disinfectants and Disinfection Byproducts (331-254)

Contact our nearest regional office from 8 AM to 5 PM, Monday through Friday. If you have an after-hours emergency, call 877-481-4901.

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