ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Haloacetic Acids (five) (HAA5): Health Information Summary

Haloacetic acids five (HAA5) refer to the five haloacetic acids most commonly found in drinking water. HAA5 consists of monochloroacetic acid, dichloroacetic acid (DCA), trichloroacetic acid (TCA), monobromoacetic acid, and dibromoacetic acid. HAA5 are more likely to be found at higher levels in water supplies with surface water sources such as rivers or reservoirs since soil and rock act as filters to reduce organic matter found in groundwater. They are formed as disinfection by-products (DBPs) when chlorine is added to kill bacteria and other pathogenic microorganisms. HAA5 react with naturally occurring organic matter in water to produce DBPs. Reducing DBPs in water systems involves balancing the benefits of preventing acute disease outbreaks against the health risks from long-term DBP exposure.

In a review of New Hampshire public water supplies with elevated HAA5, DCA and TCA were the largest percentages of the mixture, with TCA concentrations generally ranging from 55% to 65% and DCA concentrations ranging from 30% to 40% of total HAA5. The other three haloacetic acids were only occasionally detected and at concentrations below 5 micrograms per liter (µg/L = parts per billion) for each.

HEALTH EFFECTS

Absorption/Metabolism: HAA5 are well absorbed after ingesting them. They are slightly absorbed through the skin and do not vaporize into the air at bathing water temperature. Therefore, HAA5 are potential health hazards mainly from water that is used for drinking and cooking. HAA5 are eliminated from the body completely one day to two weeks after ingestion depending on the specific acid.

Short-Term (acute) Effects: Short-term effects are not likely due to HAA5 exposure. When concentrated, HAA5 have irritant and corrosive properties to the skin and eyes. However, the concentrations that form from disinfection are extremely dilute. For example, the concentration of TCA typically found in drinking water with elevated haloacetic acids is at least one million times weaker than the concentration of TCA used in products for cosmetic skin peels. Additionally, although called “acids,” HAA5 in water are at least partially in non-acidic states.

Long-Term (chronic) Effects: DCA has been used for many years in the treatment of some metabolic disorders at doses that are about 10,000 times higher than anyone would be exposed to in drinking water. Some effects seen in patients were drowsiness, metabolism changes such

as decreased fasting glucose and cholesterol, and mild toxic effects to the nervous system (tingling in fingers and toes), which subsided after treatment ended.

At high concentrations of haloacetic acids given to animals in studies, toxic effects have been identified in the liver, testes, pancreas, brain and nervous system.

Reproductive/Developmental Effects: High concentrations in animal studies have increased some developmental effects including heart and kidney malformations and lower growth rates in newborns. There are mixed results from human studies of developmental effects from DBP (which include HAA5) exposure. Recent better designed studies have not observed most of the developmental effects found in earlier studies. However, some studies continue to find associations between increasing DBP exposure and growth deficits in newborns such as a lower than normal birth weight.

Carcinogenic (cancer producing) Effects: The U.S. Environmental Protection Agency considers DCA and TCA to be potential human carcinogens. In animal studies, they have increased the incidence of liver cancer. In some human studies, exposure to DBPs, including HAA5, increased the incidence of bladder cancer. Human studies have yet to confirm that DCA or TCA exposure increases the risk of cancer. Based on the animal data, at the current HAA5 regulatory level, the cancer risk is estimated to increase by about 1 in 60,000 for every 10 years of exposure.

HEALTH STANDARDS AND CRITERIA

The federal health-based standard for the sum of HAA5, a Maximum Contaminant Level (MCL), is 60 µg/L. For public water supplies, determining whether there is an MCL violation is based on the average of multiple samples collected over time.

SUGGESTED READING AND REFERENCES

Toxicological Review of Dichloroacetic Acid. In support of summary information on the Integrated Risk Information System (IRIS). U.S. Environmental Protection Agency. August, 2003.

Toxicological Review of Trichloroacetic Acid. In support of summary information on the Integrated Risk Information System (IRIS). U.S. Environmental Protection Agency. September, 2011.

FOR MORE INFORMATION

For information on haloacetic acid regulation and testing, please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov. For information on haloacetic acid health effects, please contact the Environmental Health Program at (603) 271-1370.