Monochloramine Background

Stage 2 Disinfection Byproducts Rule

Disinfection of drinking water is vital to protect public health from waterborne diseases. The practice of disinfecting drinking water has made many once-common diseases, like typhoid and cholera, a thing of the past in the United States, Canada and other developed countries. The U.S. Centers for Disease Control and Prevention recognizes the control of infectious diseases as a result of cleaner water and improved sanitation as one of the top 10 public health achievements of the 20th century.

However, chemical disinfectants can react with organic matter found in raw water to form disinfection byproducts, with may pose health risks. The U.S. Environmental Protection agency (US EPA) has enacted new rules in recent years to reduce potential risk associated with regulated disinfection byproducts in drinking water. Specifically, the Stage 2 Disinfection Byproducts Rule has more stringent standards and monitoring requirements for two groups of disinfection byproducts, which are suspected carcinogens with prolonged exposure: trihalomethanes (TTHM) and haloacetic acids (HAA5). The goal of the regulation is to reduce disinfection byproduct exposure and related potential health risks, and to provide more equitable public health protection.

Meeting the New Rule

Exeter Public Works is committed to providing drinking water that maximizes public health and minimizes potential health risk. Using monochloramine in our system is part of that commitment.

Utilities use primary disinfectants at treatment plans to inactivate microorganisms, such as bacteria, viruses and protozoa. Examples of primary disinfectants include chlorine, ozone and ultraviolet light. Secondary disinfection is then used to keep the water safe in the distribution systems.

In late March or early April of 2019, the town will begin using monochloramine as a secondary disinfectant and continue to use Sodium Hypochlorite as a primary disinfectant.

Monochloramine (NH_2Cl) is formed by adding chlorine and ammonia under controlled conditions.

Exeter Public Works is introducing monochloramine to our system to comply with the new US EPA Stage 2 Disinfection Byproducts Rule because it produces lower levels of disinfection byproducts, and was the least expensive option to return to compliant TTHM levels in the distribution system, and maintain or be below the approved budget. Exeter Public Works chose to use monochloramine after working with New Hampshire Department of Environmental Services (NH DES), Aquagenics, and Wright Pierce Engineers.

About Monochloramine

Today, more than one in five Americans use drinking water treated with monochloramine. Monochloramine has been safely and successfully used by water utilities for more than 90 years. Boston, San Francisco, Tampa Bay, Miami, Denver Philadelphia, Minneapolis and many other cities are successfully using monochloramine to treat drinking water. In New Hampshire Concord, Manchester, Salem, & Hillsborough use monochloramine.

Monochloramine is an effective, long-lasting disinfectant. Operational benefits of using Monochloramine include:

- Fewer disinfection byproducts – Monochloramine is not as reactive as chlorine, so it forms fewer regulated disinfection byproducts.
- Better protection against bacterial re-growth – Because monochloramine residual is more stable and longer lasting than free chlorine, it provides better protection against bacterial re-grown in distribution systems with large storage tanks and dead-end water mains.
- Effective in controlling biofilm – Biofilm is a coating in the pipe caused by bacteria.
- Taste and odor – Monochloramine tends not to react with organize compounds; so many systems will experience fewer taste and odor complaints when using monochloramine.
- Ease of use – Monochloramine technology is relatively easy to install and operate.

Monochloramine & Lead

While monochloramine is not more corrosive toward metals than chlorine, it does change the chemistry of drinking water. In certain cases this may cause lead from pipes or home plumbing to dissolve into the water. However, with water quality testing and monitoring, a utility can evaluate and optimize its corrosion control treatment to reduce the possibility of this occurring. Find out more about lead in drinking water at drinktap.org.

Monochloramine Chemistry

Monochloramine is a chemical compound of chlorine and ammonia, commonly used as a diluted solution to disinfect drinking water before it is delivered to homes. The formation of monochloramine is done at very low concentrations, measured in parts per million, under stringent drinking water guidelines.

Monochloramine (NH_2Cl) should not be confused with dichloramines ($NHCl_2$) or trichloramines (NCl_3), two chemically distinct and separate compounds. Dichloramine is a reactive inorganic compound that can form along with monochloramine and free chlorine. It can react with many different materials, but its formation can be prevented or reduced to only trace levels during water treatment through careful oversight by water professionals.

Trichloramine (nitrogen trichloride) formation does not typically occur under normal drinking water treatment conditions. Trichloramine is commonly encountered as a byproduct of chemical reactions in extreme conditions – for example, in swimming pools between chlorine and bathers' waste products. This occurs rarely in water treatment.

What Customers Need to Know

With the conversion to monochloramine, our customers will continue to receive high—quality water that meets or surpasses stringent regulatory requirements. Utilities that use monochloramine often experience fewer taste/odor complaints than utilities using free chlorine.

While monochloramine is safe for drinking, cooking and all typical uses, there are special circumstances where monochloramine must be removed:

- Kidney dialyses treatments
- Keeping pets like fish and some amphibians

Since the process for removing monochloramine is different from some of the methods used to remove chlorine, medical facilities and dialyses units, as well as pet shops, seafood merchants, restaurant managers and area attractions featuring marine life, will be notified in ample time to prepare for the conversion.

Future Research on Monochloramine

Chlorine and monochloramine, the two disinfection residual options available, have benefits and drawbacks. In recent years, a small percentage of consumers have expressed concern over health symptoms they believe are connected to monochloramine, similar to consumers who have reported sensitivity to chlorine. Among the reported symptoms are respiratory problems, skin irritation and digestive problems. While the actual causes of the reported symptoms are undetermined, our first concern is the health and welfare of our customers. If consumers experience symptoms that are believed to be connected to monochloramine, we advise that person to immediately contact his or her physician and Exeter Public Works. It is possible that some individuals may be sensitive to monochloramine, just as some individuals are sensitive to chlorine.

Exeter Public Works will continue to monitor the recommendations of the U.S. Environmental Protection Agency and Center for Disease Control and Prevention as well as relevant research to make sure our operations are informed by the best available information.