

## **Town of Salem, New Hampshire Water Treatment Plant Disinfection Update**

Beginning in July of 2007, the Town of Salem will be changing the disinfectant it maintains in its distribution system from chlorine to monochloramine. Monochloramine is a combination of chlorine and ammonia. It has a number of benefits including it greater stability in the water to more effectively control pathogens and produces lower levels of trihalomethanes (a disinfection by-product and a suspected carcinogen). The Town is already in the process of changing its finished water corrosion control chemistry to be more amenable to monochloramine. The Town is slowly increasing the pH and alkalinity of its water to a target pH of approximately 9.2 and a target alkalinity of approximately 35 milligrams per liter (mg/L).

Water with monochloramine is safe for people and animals to drink, cook with, bathe in, and for all other general uses. The change to monochloramine will have long-term health benefits as it reduces the levels of trihalomethanes in the drinking water.

There are a number of specially impacted users that need to be especially aware of this change to monochloramine. These include kidney dialysis patients, aquarium owners, businesses with live fish or lobster tanks, and other businesses and industries that use water in processes or that remove chlorine from their water prior to use. Specially impacted users can find out more information in the following Frequently Asked Questions sections or by contacting Mr. William Daly, (Utilities Manager), at the Town Utilities Department at 890-2171.

### **Frequently Asked Questions**

*What changes are being made?*

The Town of Salem is changing its secondary disinfectant from free chlorine to monochloramine. A secondary disinfectant is a disinfectant chemical maintained throughout the distribution system to preserve the quality of water purified at the water treatment plant as it travels through the distribution system and prevent the growth of pathogens. Monochloramine is a less powerful disinfectant than free chlorine, so free chlorine will still be used for disinfection within the treatment plant.

As part of this change, the Town is also converting its corrosion control chemistry to work better with monochloramine. The Town is slowly increasing the pH and alkalinity of its water to a target pH of approximately 9.2 and a target alkalinity of approximately 35 mg/L as CaCO<sub>3</sub>.

*What is monochloramine?*

Chloramines are the combination of chlorine and a small amount of ammonia. Chloramination is the process that adds chloramines to drinking water. Monochloramine is one type of chloramine, which has the most beneficial properties in drinking water.

*Is monochloramine new?*

No, monochloramine has been in use at water utilities across the United States for decades. Over one third of water utilities use this process, including the Massachusetts Water Resources Authority (MWRA) which supplies water to Boston, which has been using monochloramine for more than 60 years. More recently, water utilities in Concord, NH and Manchester, NH have converted to monochloramine.

*Is monochloramine in water safe?*

Monochloramine in water is safe. Monochloramine has been in use at utilities across the United States for decades. A disinfectant in the water is essential so drinking water does not carry disease causing organisms in the water to control diseases such as cholera and typhoid. Chloramination is a recognized disinfection process by the U.S. Environmental Protection Agency (EPA) and their use has been suggested by the EPA as a way to reduce the formation of trihalomethanes, a disinfection by-product. Monochloramine helps preserve the quality of water purified at the water treatment plant as it travels through the distribution system.

Water with monochloramine water is safe for drinking, bathing, cooking, cleaning scrapes or cuts, doing laundry, watering the garden, and other uses we have for water each day. With the exception of certain specially impacted users, including kidney dialysis patients, aquarium owners and certain businesses, there will be no difference in how water can be used for most customers.

*Will these changes in water treatment change the taste of the water?*

These changes are not expected to change the taste of the water. If you notice any change at all, you may find that the water has less of a chlorine taste or smell.

*Why is the Town making this change?*

The Town of Salem is converting to monochloramine in order to deliver water to our customers with the lowest concentrations possible of trihalomethanes (THMs).

*What are Trihalomethanes (THMs)?*

THMs are chemical compounds that form when chlorine reacts with naturally occurring organic matter present in water. The U.S. Environmental Protection Agency (EPA) has conducted tests that show the chloroform (one of the THMs) is carcinogenic to laboratory animals when they are exposed to high concentrations of it in water for a long period of time; and it is a suspected carcinogen for people. The EPA has a standard of 80 parts per billion (ppb), as the safe maximum level of THMs in drinking water.

*Does the Town meet the current THM standards?*

The Town is currently in compliance with the THM standards, but has violated the standard on two occasions over the past five years. The New Hampshire Department of Environmental

Services has been supportive of the conversion to monochloramine to avoid future violations of this standard.

In addition, a new EPA Rule was recently passed that makes the 80 ppb standard more stringent by changing where in the distribution system the samples for THMs are collected as well as how the data is averaged. The conversion to monochloramine should also help the Town better comply with this rule when the new standards become effective.

*What are the benefits of using monochloramine?*

The benefits of using monochloramine as a disinfectant include the following:

- 1) Monochloramine is a more stable and persistent disinfectant than chlorine. It preserves the quality of water purified at the water treatment plant as it travels through the distribution system.
- 2) The use of monochloramine helps to reduce the formation of disinfection by-products such as trihalomethanes (THMs) in the water.
- 3) Monochloramine reduces the taste and odor of chlorine in tap water.

*What changes are being made to the corrosion control chemistry in the distribution system?*

In addition to the conversion to monochloramine, the pH and alkalinity of the water in Salem's distribution system are being increased to provide corrosion control. Corrosion control is important to prevent the dissolution of lead and copper from pipes and fittings and solder, as well as to prevent the rusting of pipes.

Once these changes are complete, the target pH of the water will be approximately 9.2 and the target alkalinity of the water will be approximately 35 mg/L as CaCO<sub>3</sub>. These changes in corrosion control are only changing the buffering of the water, and do not involve the addition of new synthetic chemicals.

*Why are changes being made to the corrosion control chemistry?*

The corrosion control chemistry in Salem is being changed in order to change the chemical conditions in the distribution system to be the most amenable for monochloramine while still maintaining corrosion control. Monochloramine is best operated at pHs above 8.5 and the Town's previous corrosion control chemistry of zinc orthophosphate addition is ineffective at a pH above 7.7.

The new corrosion control chemistry is based on pH and alkalinity adjustment, and mirrors the corrosion control chemistry that several other area utilities have successfully used, including MWRA (Boston area) and Concord, NH.

*What precautions should dialysis patients be aware of?*

During the dialysis process, water comes in contact with the blood across a permeable membrane. Monochloramine in that water would be toxic, just as free chlorine in that water is toxic, and must be removed from the water used in kidney dialysis machines. This can be done using ascorbic acid or using granular activated carbon.

Medical centers that perform dialysis are responsible for removing monochloramine from the water used by the dialysis machines. These centers in the Town of Salem will be notified. Dialysis patients can drink, bathe and cook with water with monochloramine. Dialysis patients should consult with their physician or dialysis center for more information on the precautions they must take.

*What do dialysis patients who do home-dialysis need to do?*

Patients should first check with their physician, who can recommend changes to the equipment. Often, home dialysis service centers can make the necessary changes, but check with your physician first.

*Is it safe for kidney dialysis patients to drink water containing monochloramine?*

Yes. Because the digestive process metabolizes monochloramine before it reaches the bloodstream, everyone can drink water with monochloramine. Kidney dialysis patients can drink, cook, and bathe in water with monochloramine. It's only when water interacts directly with the blood stream, as in dialysis, that monochloramine must be removed.

*Why do fish owners have to take precautions with water with monochloramine for fish, reptiles, and amphibians that live in water?*

Monochloramine is toxic to fish, reptiles, crustaceans, and amphibians that live in the water or have gills, just as free chlorine is toxic. Therefore, monochloramine needs to be removed from water just like free chlorine needs to be removed.

Monochloramine must be removed from the water before it is used. Fish owners may not have had to actively remove free chlorine from water in the past, because it dissipates fairly quickly. Monochloramine is more persistent in water and more difficult to remove. Aquarium stores sell dechlorinating agents and can provide instructions on how to use them to remove monochloramine.

*What about lobster and fish tanks at stores and restaurants?*

Commercial fish and lobster tanks will be impacted. Monochloramine is toxic to the lobsters and fish living in these tanks. Commercial fish tank owners will need to change their current chlorine removal process to remove monochloramine.

*How can aquarium owners remove monochloramine?*

Household, restaurant, and commercial fish tank owners will need to change their current chlorine removal process to remove monochloramine. Most aquarium and pet stores sell dechlorinating agents and carbon filtration units and can provide instructions on how to use them to remove monochloramine.

*Will letting the water sit for a few days remove monochloramine?*

No. Unlike free chlorine, which dissipates when water sits for a few days, monochloramine may take weeks to disappear. Therefore letting water sit or boiling it before use will not remove the monochloramine. If you choose not to use de-chloraminating chemical, install a granular activated carbon filter and allow sufficient contact time between the water and filter.

*Is the water safe for plants and other pets besides fish, reptiles, and amphibians that live in water?*

Yes. Water with monochloramine is just as safe as chlorinated water for plants and animals that do not live in water or have gills.

*What types of businesses and industries may be impacted these changes?*

Businesses and industries that may be impacted by the changes the Town is making and need to make preparations include those facilities that use ultra-pure water in their facility (such as analytical or pharmaceutical laboratories, microchip manufacturers, biotech companies), those facilities using water for food or beverage production, restaurants or seafood suppliers with fish tanks, and photographic labs.

*Why do commercial/industrial consumers with processes or equipment sensitive to water quality have to take precautions with these changes?*

Because of the persistence of monochloramine, it is difficult to remove and can have impacts on process equipment that is sensitive to oxidants such as certain membranes. In addition, the corrosion control changes may impact the amount and type of chemicals required to conduct certain pH adjustment or precipitation reactions. Most commercial and industrial customers in Town have been contacted about these changes in water quality. Contact the Town or your process equipment supplier/process engineer for further information.

*How will these changes affect household plumbing, pipes and water heaters?*

While safe for people and animals to drink, water with monochloramine may degrade rubber components more quickly than chlorinated tap water. On rare occasion, you may experience small black flakes in your water and plumbing fixtures. These signs of degradation can be easily resolved by upgrading to high quality rubber (synthetic polymers such as neoprene) parts or flexible copper tubing. Tubing made of corrugated stainless flex or newer neoprene braided stainless steel will also work.

Ask store personnel for assistance in selecting monochloramine-resistant products when replacing rubber plumbing and irrigation components such as water supply hoses, toilet flapper valves, water heater flexible connection hoses, and sprinkler parts.

The changes in corrosion control may lead to a minimal amount of a white calcium carbonate scale inside plumbing and hot water heaters. The scale is safe and non-toxic.

*How will these changes affect my swimming pool?*

The conversion to monochloramine is not expected to have any significant impact on swimming pools. The change in corrosion control chemistry may require pool owners to use more base chemicals to maintain proper pH.

As with chlorinated water, pool owners will need to maintain the same chlorine residuals as before to prevent algal and bacterial growth. Pool suppliers can provide owners with additional information.

*How can I remove the monochloramine from my water before drinking it?*

For aesthetic or personal reasons, some customers may wish to remove monochloramine from your water. This can be done with granular activated carbon or dechlorinating agents. The National Sanitation Foundation (NSF) has a helpful guide to assist you in choosing a certified drinking water filtration product for home use. (<http://www.nsf.org/certified/dwtu/>)

*What is next?*

The changes that the Town is making are one part of a multi-year project within the water system to optimize water quality and organics removal. The changes currently being implemented are associated with reducing disinfection by-products, but work remains to improve the removal of natural organic matter (a precursor of disinfection by-products).

Upcoming projects will modify the Town's storage tanks to minimize dead spots, assess ways to optimize the current plant to remove naturally occurring organic matter, and continue to assess alternative technologies that may need to be incorporated to the water plant to remove more naturally occurring organic matter.

*For More Information*

Please contact William (Bill) Daly, Utilities Manager at 890-2171.