CHLORAMINE

Chloramine is a mixture of chlorine and ammonia and is added to public water systems in addition to chlorine. It takes on many chemical forms depending on the mineral content and the pH of the water, monochloramine (NH_2Cl), dichloramine ($NHCl_2$, trichloramine (NCl_3) and as a group they are often referred as chloramines. In water systems they shift from one form to the other. All three forms are respiratory irritants and tricloramine is the worst.

When chlorine combines with organic matter in the water or elsewhere, disinfection byproducts are formed such as Trihalomethanes (THMs) and to a lesser degree when combined with chloramines. THMs are possible cancer causing byproducts. To remove THM's, disinfection methods such as ultraviolet light or chlorine dioxide must be used. However these have not been studied for their health effects. According to the World Health Organization (WHO) the best way to remove organic matter is first through prefiltration before disinfection.

Note: Water systems often claim they use mono-chloramines. However, these break down relatively quickly in the water system into the other more toxic forms.

Chloramines are not as effective and do not dissipate as easily as chlorine. Chloramines are difficult to remove and cannot be removed by boiling, distilling, standing uncovered or by some reverse osmosis filters. The disinfection byproducts of chloramines (iodoacids) are more toxic than chlorine. Chloramine vapors can accumulate in indoor air (small areas, bathrooms, kitchens, etc.).

There are not a lot of studies on chloramines and how it relates to cancer. However one study found that it causes a type of cancer in female rats. Other studies have shown that it causes reproductive toxicity and reduced reproductivity in mice and hamsters. Chloramines have also been found to cause DNA damage when ingested. For additional information on the known health effects see http://www.chloramine.org/chloraminefacts.htm

Note: Chloramines are not nearly an effective disinfectant as chlorine, "monochloramine is about 2,000 to 100,000 times less effective than free

chlorine for the inactivation of E. coli and rotaviruses". Also it does not dissipate easily as compared to chlorine and is difficult to remove.

Not a lot of studies have been done on the skin or respiratory effects. One study does show clear mononuclear cancer in female rats. Another shows reproductive toxicity and reduced reproductivity in mice and hamsters.

See Citizens Concerned About Chloramine (CCAC) http://www.chloramine.org for a more detailed list of health effects.

Note: Chloramine has been banned in Germany, France and most of Europe.

Landscaping Problems Associated with Chloramines

Chloramines are highly toxic to fish, amphibians and other aquatic life forms (Note - Canada's EPA has ruled chloramines as toxic). If one overwaters their landscape the water will enter our streams and may cause fish kills. If one has a pond in their landscape it may kill your fish as water from irrigation collects in the pond. Not to mention the runoff from broken water mains that enter our storm sewers and into our rivers and streams. This kills the minnows and crayfish that eat the mosquito eggs and larva aggravating the mosquito problem.

Note: Chloramines can also be formed in the soil when ammonia (from artificial fertilizers, animal waste, pesticides, etc.) is combined with chlorine in the water.

Chloramines make the water acidic which over time can change soil pH. This may result in nutrient tie-up and create yellowing (chlorosis) problems in many plants. Chloramines prevent the absorption of other nutrients which also may lead to yellowing.

The action of chlorine and chloramines kill bacteria both good and bad. Many good bacteria that live in the soil control fungal diseases. When we lose these good bacteria there is no natural control and turf grass diseases like "Brown Patch, Take All and St. Augustine Decline" become rampant. In other words the more one waters, the greater the chance that one will experience disease problems in their grass and other plants.

Chlorine and chloramines kill the nitrifying bacteria that fix nitrogen from the air into the soil. Hence additional nitrogen must be supplied to the plants to replace the loss of free nitrogen from nature.

Container plants (hanging baskets, pots, etc.) are more susceptible to damage from chloramines as they tend to require more watering.

Studies have shown that chloramines hurt the germination of seeds from many species of plants.

Chloramine is neutralized in the soil by reactions with organic matter, destroying it in the process. Organic matter in the form of humus can hold 15 times its weight in water, hence the soil loses some of its ability to hold and store water.

Chloramine hurts the production of compost tea as it kills off some of the microbial species that one is trying to grow to high densities. Note: One teaspoon of humic acid (liquid form of humate) can neutralize the chloramines in 100 gallons of water depending on the exact concentration of chloramines.

Using high humus products like compost, native mulches (that have been composted) and humate in ones landscape is the easiest way to minimize the damage from chloramines and chlorine. This ensures that even if some of the organic matter is destroyed and some of the beneficial microbes are killed, the soil life can quickly regenerate and prevent problems.

Chloramine Removal:

Carbon filters remove this chemical but the filter is used up much faster than for other chemicals and takes much longer to do the job. A special form of carbon, "Catalytic carbon", as it works better than standard carbon (sometimes called Centaur). In other words it will require a larger and more expensive filter to remove it.

Carbon filters remove the chlorine portion of the molecule leaving the ammonia behind hence it requires another stage of filtration such as reverse osmosis to remove it.

Vitamin C filters – For showers this works better than other types at removing chloramines. It takes about 1,000 mg of vitamin C (ascorbic acid form) to remove chloramines from 40 gallons of water.

Reverse osmosis units do remove chloramines as they generally have a couple carbon filters but they often produce large amounts of salt (sodium) in the water which can also cause problems if used to water plants.

Double counter top units work better than single stage filters for drinking water (Cool water must be used for these filters to work effectively).

Note: When chloramines is coupled with chlorine and fluoride the combined negative effects on plant and soil health is much greater.

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