MUNICIPAL WATER

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HIGHLIGHTS

- 71% of the Earth's surface is covered with water
- 97% of Earth's water is found in oceans
- 3% is found in glaciers, ice, underground, rivers and lakes
- Sources of municipal drinking water include open bodies of water and underground reservoirs
- Steps in the municipal water treatment process include: coagulation, flocculation, sedimentation, filtration, and disinfection
- Chlorine, UV Light or Ozone may be used to disinfect water
- Municipal water treatment includes the use of harmful chemicals

WATER EVERYWHERE

The planet Earth has been called the blue planet because it is saturated with water. In fact, 71% of Earth's surface is covered with water. Where is all of the water distributed? The vast oceans of our planet hold 97% of the Earth's water. Only the remaining 3% is found in glaciers, ice, underground, rivers and lakes. Although there is an abundance of water, 0.3% is available for consumption. Humans can safely drink fresh water, and most of that water comes from underground.

MUNICIPAL DRINKING WATER SYSTEMS

For a relatively large geographic area including a small town or a city, people will generally consume municipal tap water. Typically, water is drawn either from a large body of water such as a lake or from a river with a large enough volume of water. Source water is brought into a treatment facility by a system of pumps, and the treatment process begins.

The first steps in municipal water treatment include coagulation and flocculation. Chemicals such as aluminum, iron, salts or synthetic organic polymers are added to aggregate smaller particles into larger particles. The larger particles can be settled out of the water. There are large basins which include big mixing devices that stir the water. During the mechanical stirring, particles collide and stick together creating clumps called flocs.

Through the process of sedimentation, flocs settle to the bottom of the water supply through gravity because of the heavier weight. Once flocs settle to the bottom, they can be removed. Also, flocs can be removed by dissolved air flotation. Filtration through a variety of different ways further removes debris.

After water filtration occurs, disinfection and distribution are the next steps. Usually, chlorine is added for primary disinfection and UV light or ozone may also be included. In many municipalities, fluoride is added to prevent tooth decay. Because water has to be piped from treatment facilities, chemicals are added to prevent distribution system corrosion.

- Hypochlorous acid is used to reduce the numbers of harmful bacteria
- Chlorine induces cellular apoptosis
- Using too much ammonia increases the amount of harmful chemicals
- Monochloramines are carcinogenic
- NDMA is toxic
- Materials from water distribution systems can contaminate the water supply
- Exercise caution when using municipal water

ARE THESE CHEMICALS HAZARDOUS?

In short, yes. Low levels of free chlorine, hypochlorous acid, are maintained in municipal drinking water systems in order to reduce the number of harmful bacteria. Although municipalities are trying to make the water safe to drink, the introduction of free chlorine into drinking water is not a wise decision. Chlorine is an indiscriminate "killer". Chlorine promotes cellular apoptosis (cell death) with whichever living cell it comes into contact with. When chlorine is introduced into the body, systemic inflammation is the result. Many physicians and other health professionals will tell you that the precursor to cancer is inflammation.

In a process called chloramination, water treatment facilities will add ammonia to chlorine which produces monochloramines. This chemical is carcinogenic. When DMA reacts with monochloramine, NDMA is produced. NDMA and other compounds like it are highly toxic. With chloramination, there is a risk of adding too much ammonia which will produce other harmful chemicals.

A chemical cocktail is generated when using conventional water distribution systems. There is a large variety of materials that pipes, pumps, storage reservoirs and other systems components are made out of. Due to corrosion from contact with water, chemicals may leach into the water in significant enough amounts to harm the consumer. As these chemicals react with chlorine and other organic matter, the chemical content can end up being quite different by the time the water arrives at consumers' taps. Unfortunately, there is very little experimental evidence available to test assumptions made about chlorine and its reactivity with other chemicals in water distribution systems. There is reason to be cautious about the consumption of municipal water.

Readings for this Article:

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