

Health Effects of Chlorine in Drinking Water

The U.S. General Accounting Office reports that there are serious deficiencies in water treatment plants in 75% of the states. More than 120 million people (about 50% of the population) may get unsafe water according to a study conducted by the Natural Resources Defense Council.

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The contamination of water is directly related to the degree of contamination of our environment. Rainwater flushes airborne pollution from the skies, and then washes over the land before running into the, rivers, aquifers, and lakes that supply our drinking water. Any and all chemicals generated by human activity can and will find their way into water supplies.

The chemical element chlorine is a corrosive, poisonous, greenish-yellow gas that has a suffocating odor and is 2 1/2 times heavier than air. Chlorine belongs to the group of elements called halogens. The halogens combine with metals to form compounds called halides. Chlorine is manufactured commercially by running an electric current through salt water. This process produces free chlorine, hydrogen, and sodium hydroxide. Chlorine is changed to its liquid form by compressing the gas, the resulting liquid is then shipped. Liquid chlorine is mixed into drinking water and swimming pools to destroy bacteria.

Until recently, concerns about drinking water focused on eliminating pathogens. The chlorine used to reduce the risk of infectious disease may account for a substantial portion of the cancer risk associated with drinking water. Chlorination of drinking water was a major factor in the reduction in the mortality rates associated with waterborne pathogen. The use of chlorine was believed to be safe.

"Long-term drinking of chlorinated water appears to increase a person's risk of developing bladder cancer as much as 80%," according to a study published in the Journal of the National Cancer Institute.

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This view is evident in an article, which appeared on the back page of the New York Times. The report stated that with the use of chlorine, "Any municipal water supply can be made as pure as mountain spring water. Chlorination destroys all animal and microbial life, leaving no trace of itself afterwards". This statement reflected opinion accepted until recent years when halogenated organic compounds, such as chloroform, were identified in chlorinated drinking water supplies. Recent surveys show that these compounds are common in water supplies throughout the United States.

These concerns about cancer risks associated with chemical contamination from chlorination by-products have resulted in numerous epidemiological studies. These studies generally support the notion that by-products of chlorination are associated with increased cancer risks.

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In a 1992 study that made front-page headlines, and was reported on in the July issue of the American Journal of Public Health researchers at the Medical College of Wisconsin in Milwaukee found that people who regularly drink tap water containing high levels of chlorine by-products have a greater risk of developing bladder and rectal cancers than people who drink unchlorinated water. The study estimates that about 9 percent of all bladder cancer and 18 percent of all rectal cancer cases are associated with long-term consumption of these by-products. This amounts to over 20,000 new cases each year.

Morris, with epidemiologist Thomas C. Chalmers and his colleagues at Harvard, used a new technique called meta-analysis to combine the results from the 10 best studies, yielding the new findings. They report that people drinking chlorinated water over long periods have a 21% increase in the risk of contracting bladder cancer and a 38% increase in the risk of rectal cancer. "I am quite convinced, based on this study, that there is an association between cancer and chlorinated water.", says Robert D. Morris of the Medical College of Wisconsin in Milwaukee, who directed the new study.

About 90% of the population is drinking water which may contain hundreds of these Disinfection By-products (DBPs), also known as Trihalomethanes. The Environmental Protection Agency lowered the Maximum Contaminant Level for Disinfection By-products but it will be years before the new standard goes into effect.

In his book, Coronaries/Cholesterol/Chlorine, Joseph M. Price, MD presents startling evidence that Trihalomethanes, are the "prime causative agents of arteriosclerosis and its inevitable result, the heart attack or stroke." These Trihalomethanes are created when the chlorine that is added to the municipal water supply reacts with organic matter such as leaves, twigs, or chemicals from agricultural runoff.

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Here's What The Experts Have To Say:

"The drinking of chlorinated water has finally been officially linked to an increased incidence of colon cancer. An epidemiologist at Oak Ridge Associated Universities completed a study of colon cancer victims and non-cancer patients and concluded that the drinking of chlorinated water for 15 years or more was conducive to a high rate of colon cancer." Health Freedom News, January/February 1987

"Long-term drinking of chlorinated water appears to increase a person's risk of developing bladder cancer as much as 80%," according to a study published in the Journal of the National Cancer Institute. Some 45,000 Americans are diagnosed every year with bladder cancer. St. Paul Dispatch & Pioneer Press, December 17, 1987

"Although concentrations of these carcinogens are low...it is precisely these low levels which cancer scientists believe are responsible for the majority of human cancers in the United States." Report Issued By The Environmental Defense Fund

"Chlorine itself is not believed to be the problem. Scientists suspect that the actual cause of the bladder cancers is a group of chemicals that form as result of reactions between the chlorine and natural substances and pollutants in the water." (organic matter such as leaves and twigs.) St. Paul Dispatch & Pioneer Press, December 17, 1987

Greenpeace reports have found chlorine-based compounds to be the most common toxic and persistent pollutants in the Great Lakes.

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Summary and Prevention Strategies

In its proposal for revamping the Clean Water Act, the Environmental Protection Agency has recommended examining chlorine's impact on health and the environment (SN: 1/22/94, p.59). The agency's proposed \$2 million, one-year chlorine study would look at the effects of the use of chlorine and chlorine compounds in the manufacture of paper, solvents, and plastics and in disinfecting waste water and drinking water, says EPA' James F. Pendergast.

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Contaminants may enter water supplies at many points before reaching the tap. The carcinogens in drinking water at the point of use may result from contamination of source water, arise from the treatment processes, or enter as the water is transported to the consumer. Varied carcinogens may contaminate the source water, but they usually exist in drinking water at low concentrations. However, chemicals that enter drinking water during water treatment are limited in number, but appear in drinking water supplies with greater frequency than most source water contaminants.

Under conditions of average temperature, humidity, and activity, the human body loses and, therefore, must replace about 2.3 liters of water each day. Two-thirds of this consumption is in the form of water or some other beverage. Concerns about the health risks or taste of drinking water may cause those who consume tap water to shift to bottled water, or other beverages. These beverages may include sweetened soft drinks and alcoholic beverages, which can pose health risks greater than those associated with drinking water.

To stop chlorination of drinking water to eliminate the elevated cancer risks from chlorination by-products would be foolhardy. Nonetheless, the data provide strong evidence to support expanded efforts in research and development of alternatives to chlorination for the disinfection of drinking water. Chlorination is particularly effective in preventing recontamination during distribution. Alternatives must provide a similar level of protection. Perhaps the most viable alternative is point of use water treatment units.

The weight of the evidence suggests that chlorination by-products pose substantial cancer risks that should be reduced.