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Findings Link Chlorination With Bladder And Rectal Cancer

It's not a new finding, but it's one that has recently resurfaced: chlorine by-products are linked with bladder and rectal cancer. The topic has recently attracted national attention due to an analysis released in the July 1992 issue of the "American Journal of Public Health."

The analysis, which was headed by Dr. Robert D. Morris of the Medical College of Wisconsin in Milwaukee, found that 6,500 of the 44,000 rectal cancer cases per year and 4,200 of the 47,000 bladder cancer cases per year are associated with the consumption of chlorinated water. This statistic is a cause for concern since approximately three-fourths of the United State's drinking water is treated with chlorine for disinfection purposes.

Despite its link to bladder and rectal cancer, however, the authors and experts agree that the new findings should not lead to the abandonment of chlorination. "The potential health risks of microbial contamination of drinking water greatly exceed the risks," the authors said.

Chlorination is commonly used in the United States to disinfect water because of its effectiveness in destroying pathogenic (disease-producing) bacteria and other harmful organisms that may be present in water.

History Of Chlorination

Chlorination was first used in the United States in the early 1900s. Prior to that time, waterborne diseases such as cholera and typhoid fever were rampant. Major U.S. cities were suffering 100 or more typhoid deaths a year per 100,000 persons.

During the 10 years following the first use of chlorination, thousands of drinking water treatment plants began to use chlorine for disinfection purposes. The typhoid death rate fell simultaneously. Consequently, for more than 80 years, chlorination has been the primary means of disinfection for municipal water supplies and has had exceptionally positive results.

Due to improved testing capabilities during the mid-1970s, however, it was detected that trihalomethanes (THMs), including chloroform and many other volatile organic chemicals (VOCs), were present in potable drinking waters. Since these compounds were usually not present in untreated water before chlorine disinfection, it soon became clear that the trihalomethanes were present whenever chlorine was used for disinfection.

Trihalomethanes are formed when chlorine reacts with naturally-occuring organic matter such as by-products of decayed vegetation. The U.S. Environmental Protection Agency (EPA) has classified various THM compounds as either probable or possible human carcinogens and has set a Maximum Contaminant Level (MCL) of 0.10 milligrams per liter for THMs. In addition, the EPA has set a Maximum Contaminant Level Goal (MCLG) of zero for THMs. An MCLG is a non-enforceable but desirable health-related goal established at the level where no adverse effects on the health of persons is anticipated to occur. An MCL is the enforceable limit set as close to the MCLG as possible, taking into consideration the cost of water treatment by public water systems.

Following the discovery of the by-products produced by chlorination, several studies concerning chlorination were conducted. However, their results appeared to be inconsistent.

Meta-analysis

The findings reported in the "American Journal of Public Health" are drawn from a combination of 10 of these previous studies (including the National Bladder Cancer Study presented by Kenneth Cantor, Ph.D. in this issue of *WaterReview*) and uses a statistical method called "meta-analysis." Meta-analysis pools the results of smaller studies and can produce a unified result from studies that may seem inconsistent when considered individually. Combining the studies results in larger numbers and provides a greater statistical power than the studies would when considered independently.

Morris and his co-authors say that they do not intend to suggest that chlorination should be abandoned. "Nonetheless," they state, "these findings should provide an impetus to identify, develop, and implement disinfection strategies that are not associated with adverse health effects."

Home Water Treatment

Until a new strategy is found, however, there is good news for consumers who may be concerned about chlorine and its by-products in their drinking water.

Treatment technologies that reduce chlorine may be installed in the home after the water has been disinfected at the treatment plant. Activated carbon or certain specialty media filters will extract chlorine from water. Distillation and reverse osmosis drinking water systems also produce high quality water for drinking and cooking purposes, and most incorporate carbon filters.

> "Treatment technologies that reduce chlorine may be installed in the home after the water has been disinfected at the treatment plant."

In addition to reducing the harmful by-products of chlorine, these technologies can also reduce the objectionable chlorine taste and odor that may be present in chlorinated water.

When treating for harmful contaminants such as chlorine by-products, consumers are cautioned to have their water tested to determine the specific problem, select equipment designed to reduce that particular contaminant, and follow the manufacturer's maintenance and operating instructions precisely.

Please write to:

Water Quality Association
Post Office Box 606
Lisle, Illinois 60532

for more information about technologies to treat water in the home. □

EPA In Process Of Establishing Rule For Disinfectants & Disinfection By-products

The U.S. Environmental Protection Agency (EPA) is in the process of establishing a rule which will set a limit on the amount of disinfectants and disinfection by-products that can be present in municipally treated water. Although there is a lack of data regarding the health effects of disinfectants and disinfection by-products, it is known that some are considered carcinogens.

A Maximum Contaminant Level (MCL) of 0.10 milligrams per liter currently exists for total trihalomethanes (THMs). THMs are a by-product of chlorination that forms when chlorine reacts with naturally-occuring organic matter in water. An MCL is an enforceable standard set by the EPA. The current standard was put into effect in 1979 and applies only to water treatment systems serving more than 10,000 people.

> "The goal of the EPA is to establish a standard that will reflect the point where the risks caused by disinfection by-products and the risks caused by microbial disease are the lowest."

The new standard for disinfectants and disinfection by-products (D-DBP) will apply to all public water systems and will include standards for individual THMs and possibly also a standard for total THMs and other disinfection by-products such as chloroacetic acid, chloroacetonitriles, chlorate, and chlorite.

Regulatory Negotiation

The EPA has chosen to use regulatory negotiation, commonly known as "reg neg," to establish the new rule. The reg neg process incorporates public consensus prior to the proposal of the rule. This will be the first time a drinking water rule will proceed through the reg neg process.

According to Stig Regli of the EPA, the agency chose to use the negotiation route because it anticipated there would be difficulty in balancing the trade-offs of the risks involved with disinfection and its by-products. The EPA recognizes that it may not be possible, within the economic constraints of municipal water treatment, to reduce the risk of disinfection by-products without creating a greater risk of waterborne disease. "We're really reaching out to the public for help [in drafting this rule]," Regli said.

Risks Involved

Studies have linked disinfection by-products with bladder and rectal cancer (see story on other side). Although there are negative health effects caused by the by-products of disinfection, the disinfection process eliminates other negative health effects concerning microbial risks. The process of disinfection destroys pathogenic (disease-producing) bacteria and other harmful organisms that may be present in water. The threat of diseases such as cholera and typhoid fever are eliminated as a result of disinfection. Thus, disinfection by-products present more chronic, long-term effects, while microbial risks are more widespread and acute.

The goal of the EPA is to establish a standard that will reflect the point where the risks caused by disinfection by-products and the risks caused by microbial disease are the lowest.

A consultant will manage the reg neg process for the EPA and select the participants of a roundtable which will include approximately 20 to 30 representatives from health agencies, small water systems, and other members of the drinking water community. Roundtable sessions will be open to the public.

The rule coming out of that process will then proceed through the normal process of an EPA proposed rule. There will be a period of public comment and response that will be followed by final promulgation.

The EPA intends to propose the D-DBP regulations in June 1993 and promulgate them in June 1995, meaning that the earliest date that water systems would be required to begin complying with the requirements would be January 1997. □

Consumers Ask. . .

Q. I know that chlorination is the most common method of disinfection, but are there any other methods?

A. Yes, there are a variety of methods of disinfection. A common variant of chlorination is chloramination which uses both chlorine and ammonia to disinfect water. Distillation is another effective method, and ultraviolet (UV) disinfection units, which utilize ultraviolet light, are a growing trend in disinfection.

Ozonation is another disinfection method. It uses ozone generators to produce small quantities of ozone gas which effectively kill bacteria. Bromine and iodine feed are relatively new methods of disinfection which have been used successfully in the disinfection of swimming pools, but bromine is not recommended for drinking water, and iodine is not recommended for long-term or routine drinking water supply application. □

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