In 1980, Americans starting adding chlorine to drinking water to kill bacteria and viruses that cause serious diseases like typhoid, cholera, polio and hepatitis. In the U.S., today, all public water from surface sources (rivers, streams and lakes) is chlorinated.

Chlorine is a highly reactive chemical, which is one reason why it makes such a good disinfectant even in parts-per-million concentrations. However, in addition to killing germs, chlorine reacts with organic substances found naturally in drinking water (humic acids, for example), and causes the formation of a class of chemical compounds called trihalomethanes (or THMs). Some trihalomethanes have long, obscure names like bromodichloromethane (a carcinogen in rodents), dibromochloromethane, dichloroethylene, and dichloroethane, but some are better known, such as chloroform, benzene, carbon tetrachloride, and toluene, all of which are known or suspected carcinogens.

In 1974 Robert Harris, a scientist then working for the Environmental Defense Fund (a traditional environmental group) published a report showing a statistical link between cancer-causing substances in drinking water and cancer incidence among humans in New Orleans, LA. When Harris's report hit the newspapers, it created an uproar. Harris was pilloried, as Rachel Carson had been 12 years earlier for publishing Silent Spring. The water suppliers of America, municipal officials, and many Right Thinking public health scientists went berserk. "Absurd!" they said. "Hair-brained!" "Probably a communist!" According to the conventional wisdom, chlorinating water was good for people, not bad, and it was "irresponsible" to suggest otherwise.

Now a massive new study has been reported in the JOURNAL OF THE NATIONAL CANCER INSTITUTE, based on analysis of the water consumption habits of 2805 white men and women who have bladder cancer, compared to 5258 white men and women (matched for age, sex, and geographic area) who do not have bladder cancer. The study drew subjects from 10 geographical regions: Atlanta, Detroit, New Orleans, San Francisco, and Seattle, plus the states of Connecticut, Iowa, New Jersey, New Mexico and Utah.

Trained interviewers administered a standardized questionnaire to subjects (and controls) in their homes. Questionnaire items elicited a life history including lifetime use of artificial sweeteners and tobacco products, coffee consumption, use of hair dyes, a lifetime occupational history, and a history of relevant medical conditions.

In a separate survey, trained data collectors analyzed records from, and conducted interviews with managers at 1102 water companies in the 10 geographical areas the study covers (plus New York City and Chicago, because so many subjects had lived in those places at one time or another). Water samples were also collected from every water supplier, and analyzed for trihalomethanes.

People use tap water for coffee, tea, reconstituted juice, soup, and plain drinking water, as well as for cooking. (Beer and soft drinks are customarily deionized and charcoal filtered, removing most chlorine byproducts and other contaminants.) The average water intake among men in the study was 2 liters per person per day, 1.4 liters of it from tap water. Women drank, on average, 1.7 liters of water per day, 1.35 liters of it from tap water. The study revealed that those who drank 8 cups of chlorinated tap water for 40 to 59 years had a 40% greater risk of bladder cancer than those who drank less tap water or who drank unchlorinated water. People who drank the most tap water for 60 years had an 80% greater risk of bladder cancer.

The effect was most pronounced among non-smokers. The researchers speculated that the effect of smoking (which does cause bladder cancer, as well as lung cancer and several other cancers) overwhelmed the effect of chlorinated water among smokers. Among non-smokers who drank chlorinated water for 60 years, the risk of bladder cancer was increased 310%.

The authors of the report emphasized that cigarette smoking and occupational exposure to carcinogens are the main causes of bladder cancer. Bladder cancer is diagnosed in 33,000 men and 12,400 women in the U.S. each year. Among men, 70% of this is caused by cigarette smoking and occupational exposure, the authors believe, and among women 40% comes from these causes.

Still trihalomethanes in drinking water appear to be a significant contributor to the nation's total bladder cancer problem. Among the subjects in the present study, 12% of the bladder cancer (336 cases) could be explained by chlorinated water, the authors calculate. Among nonsmokers, 27% of the bladder cancers are explained by chlorinated water.

Dr. Harris and many other scientists have said for a long time that we should consider changing our method of disinfecting drinking water. Europeans do not chlorinate their water because they do not like the taste it gives to the water; instead, they bubble ozone through their water, which kills germs but does not affect the taste. It also does not create cancer-causing trihalomethanes.

Two conclusions: Chlorinating our drinking water solves some problems but creates others. We should switch to ozone treatment, abandoning chlorine. Second, this study gives powerful new evidence that chlorinated chemicals cause human cancers. Their industrial use should be reduced.

For a free copy of this important study, contact Dr. Kenneth Cantor, Landow Building, Room 3C08, National Institutes of Health, Bethesda, MD 20892; phone (301) 496-1691. Ask for a reprint of "Bladder Cancer, Drinking Water Source, and Tap Water Consumption: A Case-Control Study," JOURNAL OF THE NATIONAL CANCER INSTITUTE, Vol. 79, No. 6 (Dec., 1987), pp. 1269-1279. Footnotes 8 through 25 provide citations to 18 separate studies linking trihalomethanes to various cancers. Your local librarian can help you track down copies of the 18 studies.

--Peter Montague

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Descriptor terms: chlorination; chlorine; water; drinking water; cancer; bladder cancer; risk assessment; ozone; trihalomethanes; carcinogens; robert harris; edf; ia; rachel carson; tobacco; american cancer society; ga; mi; la; ca; wa; ct; ia; nj; nm; ut; opinion surveys; health; health statistics; studies; findings;