time is increased but is less reactive with organic contaminants thereby reducing the level of trihalomethane by-products such as chloroform that are suspected to be carcinogens. Chloramination is currently being used in 20% of the major water treatment systems in the United States.

Are there any viable alternatives to using chlorine-based disinfection processes? Both ozone and ultraviolet radiation are effective disinfectants, yet they are more expensive and, most importantly, afford no residual protection in case of contamination of the water supplies downstream of the water treatment facilities.

History of water chlorination

According to a paper from the Chlorine Institute, "Exceeding All Expectations: A Short History of Chlorination,"

"The purification of drinking water through chlorination has its roots well over a century ago, for the earliest printed reference to it appears in an 1835 book, *Human Health,* by a Philadelphia physician named Robley Dunglinson. To make 'the water of marshes potable,' he stated, 'it has been proposed to add a small quantity of chlorine or one of the chlorides.'

"The first city to chlorinate its entire water supply was Maidstone, England, where hypochlorite bleaching powder was so used in 1897. Ostend and Middlekerke, Belgium, followed in 1900 and 1902, respectively. Lincoln, England, began chlorination during 1905, but perhaps most significant was the adoption at the Boonton, New Jersey, reservoir in 1908. Up to this time the total amount of water chlorinated was relatively small, but the Boonton facility delivered 40 million gallons of water each day to Jersey City. Within three years, over 800 million gallons of water were being treated daily–in such cities as New York, Philadelphia, Baltimore, St. Louis, Kansas City, Montreal and Ottawa.

"The second use of chlorine itself, and the first to involve liquid chlorine as a source material, was supervised by Major C.R. Darnall of the U.S. Army Medical Corps at Fort Myer, Virginia, during 1910—less than a year after liquid chlorine was first produced in the United States. Further tests were conducted at Philadelphia in September, 1912, and the first full-scale tryout came later that year at Niagara Falls, New York, under the direction of Dr. Georg Ornstein, while the city was undergoing a typhoid epidemic.

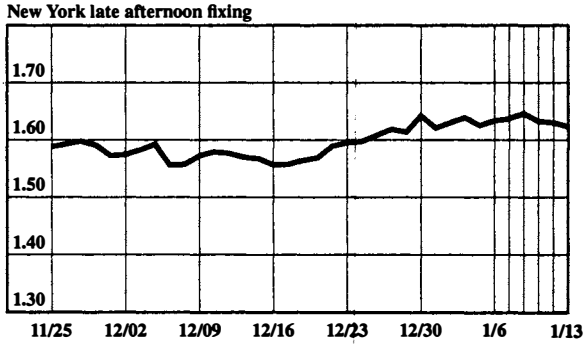
"The first permanent chlorinator to use liquid chlorine was erected in Philadelphia in 1913. The process was so convenient that by the end of World War I, well over three billion gallons of water were being treated each day in more than a thousand North American cities."

Until a replacement can be found that has a residual capacity to disinfect our drinking water, it would be hazardous to eliminate chlorine-based compounds in our public water treatment systems. It is important that people who are less able to afford medical treatment are not placed in greater risk of contracting waterborne diseases.

Currency Rates

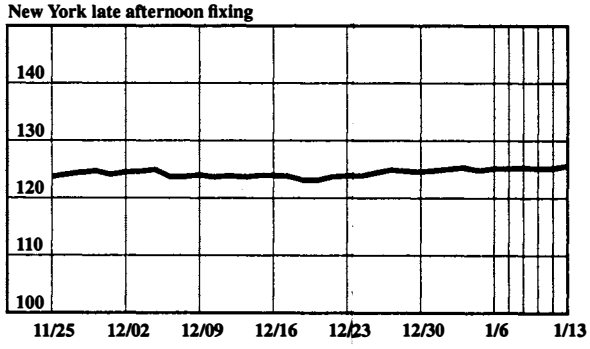
The dollar in deutschemarks

New York late afternoon fixing



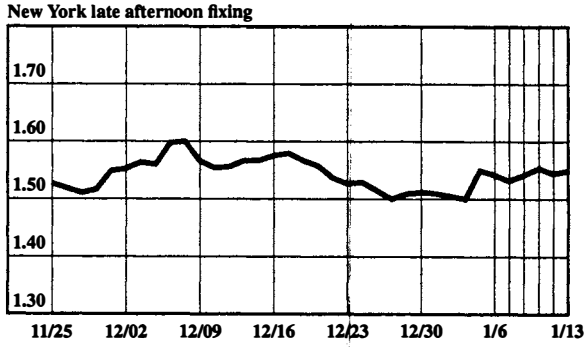
The dollar in yen

New York late afternoon fixing



The British pound in dollars

New York late afternoon fixing



The dollar in Swiss francs

New York late afternoon fixing