



# Aquatic Consulting Services

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## Pool Tip #14: Chlorine

### History

Chlorine was discovered in 1774 by Swedish pharmacist Carl Wilhelm Scheele. Scheele was performing an experiment which involved the mixing and heating of manganese dioxide and “marine acid” (hydrochloric acid). The yellow-green gas that resulted was chlorine. But, it wasn't until 1810, that English chemist, Sir Humphrey David proved that chlorine was a separate element.

In 1895, Olin Corporation (then known as the Mathieson Alkali Company) opened its first chlorine plant to manufacture calcium hypochlorite. In 1909, the Niagara Alkali Company discovered a way to make chlorine into a liquid form by cooling and pressurizing gas chlorine. Then in 1927, Olin Corporation began manufacturing the HTH brand of calcium hypochlorite for swimming pool disinfection.

### Chlorine Facts

Chlorine is the 17<sup>th</sup> atomic element, and a member of the halogen family of elements. Chlorine gas is about 2.5 times heavier than air, and liquid chlorine is 1.5 times heavier than water. Chlorine is slightly soluble in water, has a distinctive odor, and is greenish-yellow in color. Chlorine is neither flammable nor explosive, but it is combustible if it reacts with other materials. Because it is highly reactive, chlorine is found in nature only in combination with other products.

Chlorine is made today by passing an electrical current through a solution of salt water. As by-products of chlorine formation, sodium hydroxide (caustic soda or lye) and hydrogen gas are also produced.

### Other Uses

Interestingly, although the general public primarily associates chlorine with swimming pool water disinfection, less than 1% of chlorine produced, in the form of elemental gas chlorine and chlorinated compounds, is used for pool water treatment.

In addition to pool water treatment, chlorine has thousands of other uses. Chlorine is used to treat drinking water to make it safe for human consumption. It was

first used for this purpose in 1904 in Lincoln, England to stop the typhoid epidemic that had been plaguing the city. Chlorine was first used in the United States in 1908, to treat the municipal water supply in Jersey City, NJ. Today, more than 98% of the U.S. drinking water supply is treated with chlorine.

One of chlorine's initial uses was as a bleaching agent to whiten clothes. The French were whitening and brightening their clothing with chlorine as early as 1790. Chlorine was used as a chemical weapon by the Germans in World War I. Today chlorine is used in the manufacture of explosives. Inhalation of diluted chlorine was popular as a treatment for the common cold during the 1920s.

Today, chlorine is used for cleaning and disinfecting, bleaching paper, food preparation, sewage treatment, and in the manufacture of thousands of medical, industrial and common household products including solvents, gasoline, transmission fluid, rocket fuel, pesticides and herbicides, cosmetics, perfumes, and deodorants, and pharmaceuticals. Vinyl plastics, from food wrap and home siding materials, to PVC pipe and vinyl liners all require the use of chlorine.

## **Environmental and Health Concerns**

Chlorine is a respiratory irritant. Death can result from lengthy exposure to high concentrations of chlorine in air (greater than 50 ppm), or 300 - 400 ppm exposure for 30 minutes (IDLH 10 ppm). Health concerns over chloroform exposure, and carcinogenic by-products such as MX (a compound produced when chlorine reacts with organic material in water), continue to be studied by researchers at the National Cancer Institute and the National Institutes of Health.

Chlorine is hazardous to aquatic plants and fish, and can certainly damage vegetation, but some environmental groups' campaigns to ban chlorine are over broad. Environmental concerns over spills, disposal of chlorinated pool water, and the release of chlorine into the environment have introduced secondary containment requirements and neutralization tank installment to the pool industry.

Without chlorine, cholera, typhoid fever, dysentery and other water borne diseases would be rampant. The lifespan of the average American would be shortened.

Over 10 million tons of chlorine are used annually in North America. A ban on the use of chlorine would have an economic impact in the trillions of dollars.

Supplemental and alternative products for pool water treatment continue to be introduced, but currently no single, stand alone product or chemical, works as well as chlorine for both sanitizing and oxidizing recreational pool water.