



## DRINKING WATER CHLORINATION

### The Issue

Chlorine is a disinfectant added to drinking water to reduce or eliminate microorganisms, such as bacteria and viruses, which can be present in water supplies. The addition of chlorine to our drinking water has greatly reduced the risk of waterborne diseases.

### Background

For more than a century, the safety of Canadian drinking water supplies has been greatly improved by the addition of chlorine. Disinfecting our drinking water ensures it is free of the microorganisms that can cause serious and life-threatening diseases, such as cholera and typhoid fever. To this day, chlorine remains the most commonly used drinking water disinfectant, and the disinfectant for which we have the most scientific information.

Chlorine is added as part of the drinking water treatment process. However, chlorine also reacts with the organic matter, naturally present in water, such as decaying leaves. This chemical reaction forms a group of chemicals known as disinfection by-products. The most common of these by-products are trihalomethanes (THMs), which include chloroform. The amount of THMs found in drinking water depends on a number of things, including the season and the source of the water. For example, THM levels are generally lower in winter than in summer, because the amount of natural organic matter is lower and less chlo-

rine is needed to disinfect at colder temperatures. THM levels are also low when wells or large lakes are the drinking water source, and higher when rivers or other surface waters are the source, because they generally contain more organic matter.

### The Benefits of Chlorine

Current scientific data shows that the benefits of chlorinating our drinking water (less disease) are much greater than any health risks from THMs and other by-products. Although other disinfectants are available, chlorine remains the choice of water treatment experts. When used with modern water filtration methods, chlorine is effective against virtually all microorganisms. Chlorine is easy to apply and small amounts of the chemical remain in the water as it travels in the distribution system from the treatment plant to the consumer's tap. This level of effectiveness ensures that microorganisms cannot recontaminate the water after it leaves the treatment plant.

### Alternatives to Chlorination

A number of cities use ozone to disinfect their water, because ozonation does not produce THMs. Although ozone is a very effective disinfectant, it breaks down quickly and cannot be used to maintain disinfection in the distribution system.

Small amounts of chlorine or other disinfectants still must be added. Renovating water treatment plants so they can use ozone can be expensive.

Examples of other disinfectants include chloramines and chlorine dioxide. Chloramines are weaker disinfectants than chlorine, but are very effective in the distribution system. Chlorine dioxide can be used in the treatment plant, but it is not very effective in the distribution system .

All chemical disinfectants used in drinking water can be expected to form by-products that could affect human health. In general, we know less about the by-products of other disinfectants than about chlorination by-products.

## The Risks of Chlorination By-Products

Lab animals exposed to very high levels of THMs have an increased risk of cancer. Several studies on humans have also found a link between long-term exposure to high levels of chlorination by-products and a higher risk of cancer. For instance, a recent study showed an increased risk of bladder and possibly colon cancer in people who drank chlorinated water for 35 years or more.

High levels of THMs may also have an effect on pregnancy. A California study found that pregnant women who drank large amounts of tap water with high THMs had an increased risk of miscarriage. These studies do not prove that there is a link between THMs and cancer or miscarriage. However, they do show the need for further research in this area to confirm potential health effects.

## How the Government Protects Your Water Supply

The federal and provincial governments share responsibility for safe drinking water. Provincial governments are generally responsible for the day-to-day provision of drinking water to their constituents. The water they provide must meet their own drinking water requirements, which are based on the Guidelines for Canadian Drinking Water Quality. These guidelines are published by Health Canada and developed in collaboration with all provincial and territorial governments. Health Canada publishes an annual table summary of the guidelines, which is available on its Web Site.

Health Canada has established a guideline for THMs of 0.1 milligrams per litre. The cancer risk at this level over a lifetime is considered extremely low. The guidelines for THMs and other chlorination by-products are currently under review by a task group whose work is coordinated by Health Canada.

## Minimizing Your Risk

Drinking water that meets the guidelines does not usually need extra treatment. There is no easy way that you can remove all disinfection by-products, but here are some steps you can take.

- Activated carbon filters can be used to remove chlorine and its by-products. If you choose to use such a filter, it is essential to follow the manufacturer's instruction
- The manufacture and sale of water treatment devices are not regulated in Canada. Health Canada recommends the use of products that are certified to health-based standards. The Standards Council of Canada can provide information on the certification process.

## Need More Info?

For more information on drinking water quality issues in Canada, please visit Health Canada's Water Quality Activities Web Site at [www.hc-sc.gc.ca/waterquality](http://www.hc-sc.gc.ca/waterquality)