What you should know about Drinking Water Quality

Contamination of drinking water by microbial pathogens or chemicals can result in illness and economic hardship. Twenty-nine water-borne disease outbreaks have been reported in BC communities in the last 25 years. As well, there have been a large number of boil water notices issued in BC, between 200 and 300 from 1996 to 2001 (Annual Report on Drinking Water Quality in BC, 2001). Most of these notices were on small water systems serving 15 to 1500 residents. The Drinking Water Protection Act contains requirements to improve the drinking water quality of these vulnerable systems, many of which serve rural and remote communities.

Water Quality in Canada

The *Guidelines for Canadian Drinking Water Quality* (GCDWQ) are used by Health Authorities and other agencies to assess the safety of drinking water and to help determine treatment needs. Drinking water can be sampled at various points along its journey. Samples are analyzed and the results are compared to the guidelines and other standards to determine if the water is safe to drink.

The guidelines for microbial pathogens are based on contaminants that can make you sick soon after ingesting them. Other guidelines, like those for some chemicals and metals, are based on contaminants that can make you sick after consuming small amounts of them over a period of decades.

Water Quality in BC

In BC we are blessed with an abundance of surface water, the chemical quality of our surface water is usually very good in comparison to the GCDWQ. The main health risks associated with surface water in BC are from microbiological organisms. Disease causing viruses, bacteria and parasites, called pathogens, enter surface water through recreational, industrial, agricultural and natural processes. When consumed in drinking water they may cause serious long lasting illnesses or death.

All water suppliers using surface water must provide disinfection. The GCDWQ recommends surface water must also be filtered, unless it meets four exclusion criteria as outlined in Section 3.3 of the turbidity supporting documents. **To help you determine if your water system is capable of safeguarding you against pathogens, Interior Health developed the "4·3·2·1·0 Drinking Water Objective." The objective is derived from the GCDWQ and other industry and regulatory practices.**

4·3·2·1·0 Drinking Water Objective

4 refers to the inactivation of viruses

3 refers to the removal or inactivation of parasites

2 refers to two treatment processes for all surface water or unprotected groundwater

1 refers to maintaining a turbidity of less than 1 NTU.

0 refers to indicators of bacterial contamination either Fecal Coliform or *E. Coli* bacteria

4 Virus Inactivation

For every 10,000 viruses in the water, your treatment system should be capable of inactivating 9,999 of them. This is referred to as a "4 Log" inactivaton.

Most viruses are easily inactivated by the use of chlorine. The common practice of maintaining 0.5 mg/L of free chlorine for 20 minutes is adequate in most cases. UV light will also inactivate most viruses in clear water if the light is bright enough, and the duration of exposure to the light is sufficient.

3 Parasite Removal or Inactivation

For every 10,000 parasites in the water, your treatment system should be capable of removing or inactivating 9,990 of them. This is referred to as a "3 Log" removal. The two most common parasites are *Giardia* and *Cryptosporidium*.

To remove parasites filtration is required. Parasites are usually about 2-10 micrometers in size. You will need to use a filter capable of filtering down to "1 micron absolute" to ensure that parasites are removed. Small water systems should look for a filter with a NSF-53 certification.

Large doses of free chlorine may inactivate *Giardia* if the water has a very long contact time. Chlorine will not inactivate *Cryptosporidium*.

To inactivate parasites you will need to use ultraviolet light, or ozone. Ultraviolet disinfection will provide a 3.0 log inactivation of parasites if the dose is a minimum of 40mj/sq. cm. To ensure there are safeguards built into your UV System, you should ensure your treatment device has a NSF-55 certification.

2 Treatment Barriers

There is no single practical universal treatment technology that can assure drinking water safety on its own. A minimum of two treatment barriers is required for water that is at risk of containing pathogens. Filtration and disinfection should be considered on most water supplies to ensure a safe supply of water. UV light and chlorination can be considered for source water that meets the criteria for the exclusion of filtration as outlined in the GCDWQ (for example, a well beside a lake).

1 Turbidity

Turbidity of less than 1 NTU should be maintained. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles. It is not a measurement of the particles themselves. In general terms, the cloudier the water, the more the light scatters and the higher the turbidity. The health risk increases as

turbidity increases. The health risk will increase before you notice cloudy water.

These particles can be clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms, they can inhibit disinfection or treatment and shelter pathogens. In order for disinfection and treatment systems to be effective, the water must be less than 1 NTU. Clarity of water at this level is usually only seen in wells or after filtration. For more information see the Turbidity Supporting documents in the GCDWQ.

0 Bacterial Indicators

Disease causing organisms are called pathogens. Most of the viral, bacterial and parasitic pathogens that contaminate drinking water are shed from the feces of humans and animals. It's not practical to test for each possible pathogen so an indicator organism, like *E. coli,* is used to test for the presence of disease causing microbes. Finding an indicator organism in a drinking water sample can mean that pathogens are also present. There should be "0" indicator organisms present in a water sample. The water sampling results must meet the Water Quality standards of the Drinking Water Protection Act.

Contacts and Links

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Guidelines for Canadian Drinking Water Quality
http://www.hc-sc.gc.ca/ewh-semt/water-eau/index_e.html

Interior Health:
http://www.interiorhealth.ca

How can I tell if my water system is producing drinking water that meets the 4·3·2·1·0 Drinking Water Objective?

Is my water source a confined aquifer?	**Y**	**N**	**Don't Know**
Do I use chlorine to disinfect my water?	**Y**	**N**	**Don't Know**
Is there a minimum of 0.5 mg/l of free chorine for 20 min before the 1st customer?	**Y**	**N**	**Don't Know**
Do I know my water turbidity levels?	**Y**	**N**	**Don't Know**
Is the turbidity less than 1 NTU all year long?	**Y**	**N**	**Don't Know**
Do I use a "1 Micron Absolute" filter?	**Y**	**N**	**Don't Know**
Is my UV unit NSF 55 Certified?	**Y**	**N**	**Don't Know**
Does my UV Unit produce 40 mj/cm2?	**Y**	**N**	**Don't Know**
Do I use two of the following treatment barriers? ***Filtration, Chlorine disinfection, UV disinfection***	**Y**	**N**	**Don't Know**

These are some of the questions you can use, to find out if your system meets the water treatment objectives. If you answered No or Don't Know to any of the questions, then your water treatment system may not be producing safe water, and you should contact a Drinking Water Officer or someone knowledgeable about water treatment to have your system assessed.

If you answered YES to all of the above questions then you may have adequate treatment protection. You should review the Multi barriers document to see what other barriers you can put in place to safeguard your system.

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DRINKING WATER QUALITY

4·3·2·1·0 Drinking Water Objective

The Countdown to Safer Drinking Water

An explanation of water treatment objectives

Interior Health