VOLUME 3 ISSUE 1

North Island Labs

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January 2008

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Flouride & Boron–

Studies show that in certain regions groundwater contains contaminants that are harmful to human health. Fluoride is amongst the most notable of these contaminants, being the 17th (McNeely et al., 1979) most abundant element in the earth's crust. Fluoride content of groundwater varies greatly from place to place. Naturally occurring, most fluoride in groundwater comes from the breakdown of rock or soil. Human sources that contribute to fluoride contamination in groundwater include chemical fertilizers, sewage discharges in communities with fluoridated water supplies and liquid wastes from specific industrial activities.

Studies have shown that fluoride levels in groundwater are related to pH and calcium levels. Studies have shown a strong correlation between fluoride and boron. Wells that have both high boron and fluoride levels are exclusively located in sandstone formations (ref: http://www.mala.ca/geology/Research.asp).

Fluoride is the 17th most abundant element in the earth's crust.

Like fluoride, boron occurs naturally, representing 0.001% of the earth's crust, and is also associated with volcanic rock formations. As with fluoride, factors influencing boron's solubility in water include pH, cation exchange capacity and temperature.

Boron compounds, most notably boric acid and sodium borate (borax) are used in the preparation of disinfectants and drugs, manufacture of borosilicate glass, enamels and in the cosmetics, leather, textile, paint and wood-processing industries. Borax and boric acid are also used in Canada as fungicides on vegetables, fruits and trees.

Groundwater Quality

The Maximum Acceptable Concentration (MAC) of fluoride in drinking water in Canada is 1.5 mg/L. Between 1977 and 1993, the Ministry of Environment's Water Quality Check Program evaluated groundwater samples taken throughout British Columbia. Of the over 8,500 samples analyzed, only 3.1% had fluoride levels above 1.5mg/L and 0.1% had fluoride concentrations greater than or equal to 10mg/L. High fluoride concentrations in groundwater were seen near the communities of Armstrong, Duncan, Enderby, Gabriola Island, Ladysmith, Nanaimo, Okanagan Falls, Penticton, Salmon Arm, Saltspring Island, Vernon & Westbank.

Wells with high levels of both fluoride and boron are exclusively located in sandstone formations

Fluoride levels that exceed the drinking water guidelines may also occur in other regions of the province with similar rock or soil types. Fluoride concentrations up to 13.4 mg/L have been found in bedrock wells at a number of Gulf Island sites (Kohut & Hodge, 1985). These higher concentrations are associated with aquifers in shale and clay strata and may be attributed to marine shales containing fluorapatite. (Kohut, Foweraker & Hodge, http://www.mala.ca/geology/Research.asp). Wells that have both high boron and fluoride levels are exclusively located in sandstone formations (ref: http://web.mala.bc.ca/earle/geol304/304g.pdf).

Health & Safety

Sources of Boron Contamination

- Disinfectants
- Pharmaceutical Drugs
- Manufacture of borosilicate glass
- Enamels
- Cosmetics
- Leather, textile, paint and wood processing industries
- Fungicides

Fluoride in drinking water has been much debated and attracted public attention. Its known health benefits of reducing cavities at low concentrations have led to the practice of fluoridation of public water supplies. British Columbia has traditionally had the lowest percentage of provincial population (approximately 4.5%) in Canada consuming fluoridated water. BC's two largest population centres, Victoria & Vancouver, do not fluoridate their drinking water.

Studies have shown that children drinking fluoridated water can expect to have up to 35% less tooth decay than those drinking non-fluoridated water. However, repeated exposure to higher levels of fluoride can cause dental fluorosis, which results in tooth discoloration, pitting and alteration of teeth enamel. Chronic exposure of even higher levels of fluoride can cause skeletal fluorosis, joint pain, restriction of mobility and a possible increase in the risk of fractures.

There is some indication that boron might be considered an

essential element but conclusive evidence is still pending. Boron is quickly and easily absorbed from our intestine and is quickly eliminated mainly in our urine. Almost half of the boron ingested is eliminated during the first 24 hours after intravenous administration. Boron does not accumulate in normal body tissues.

Reducing Fluoride & Boron Levels in Drinking Water

Fluoride

If your well is found to have fluoride concentrations higher than the maximum allowable concentration of 1.5mg/L, it is recommended that steps be taken to reduce the fluoride content. Please note that boiling water or using a pitcher-type carbon filtration device or water softener will not remove fluoride from your water. Effective home treatment methods are available. Several options are:

- The cheapest, but probably least convenient, is to find an alternative source of drinking water, such as bottled water.
- Distillation - removes 100% of the fluoride.
- Reverse osmosis - removes 65% - 95%.
- Charcoal or carbon filters containing activated alumina may remove more than 80%.
- De-fluoridation filters - usually expensive and can require frequent replacement & maintenance.

When choosing a treatment system consider maintenance costs and disposal of used parts

The effectiveness of these systems is affected by factors such as cleanliness of filters and available water pressure. These systems also require regular maintenance to ensure that they are performing at their optimal level. The effectiveness of multi- & single media filters is variable dependent upon the type and manufacturer's specifications. It is important to check that you are installing a filtration system that has SCC or NSF certification as being capable of removing fluoride specifically.

When choosing a treatment system, it is worth considering volume of household consumption, disposal of used parts & filters, maintenance costs & frequency in addition to the initial cost of the equipment.

Boron

Conventional treatment systems are typically ineffective at removing boron from water. However, adsorption methods using both magnesium oxide and ion exchange processes have been reported to be 85 to 90% effective in removing boron from drinking water supplies.

Web Links

Supporting Fluoride/Boron Documents

http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/boron-bore/index-eng.php

http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/fluor-eng.php

Recycling Programs

Comox & Strathcona Districts
www.rdcs.bc.ca/section_recycling/

Nanaimo, Parksville & Qualicum Beach
www.rdn.bc.ca/cms.asp?wpID=98

www.recycling.bc.ca/index.htm

General Water Quality

Should I get my water tested?
www.bchealthguide.org/healthfiles/hfile45.stm

Action Plan for Safe Water in BC
www.healthservices.gov.bc.ca/cpa/publications/safe_drinking_printcopy.pdf

Water quality and health
www.hc-sc.gc.ca/ewh-semt/water-eau/index_e.html

Ground water basics
www.groundwater.org/gi/gi.html

Groundwater in Canada
http://www.ec.gc.ca/water/en/nature/grdwtr/e_gdwtr.htm

Water Stewardship BC
www.env.gov.bc.ca/wsd/

Guide to well water treatment and maintenance
www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/well-puits_e.html

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Please email us at nilen@telus.net if you wish to be removed from our newsletter listing.

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Use the calendars to schedule your recycling