

Feature Article: Arsenic in Well Water

By J. Haddock

Arsenic can pose a serious health concern in well water if being used as a drinking water source. Natural arsenic containing minerals are distributed throughout the earth's crust and can cause arsenic levels that vary significantly from well to well. Arsenic is often associated with bedrock formation and is thus a relevant concern for deep or shallow wells which pass through these formations. Areas with geothermal activity¹ can also experience higher levels of arsenic in groundwater. The safest bet is to test for total arsenic at some point in time during well ownership.

Anthropological sources^{1,6} of arsenic include industrial processes such as coal production and coal burning power plants, smelters, mineral processing and mining, glass manufacturing and leaching from contaminants in landfills/waste piles. Widespread use of pesticides containing arsenic can also result in increased arsenic levels in the environment. Urban areas tend to be more susceptible to contamination than rural areas, depending on the type of industry nearby.

A silent threat, arsenic has no taste or colour. Arsenic toxicity depends on the following^{1,5,6}:

- *Valency*: Trivalent arsenite (As^{3+}) compounds are generally more toxic than pentavalent (As^{5+}) arsenate compounds^{1,6}. Interestingly enough, bacteria can play a role in changing the valence and are thus another factor⁵. Arsenate tends to be the most common species present in highly oxygenated conditions such as surface waters. The trivalent arsenite species becomes the more predominant form in reducing, low-oxygen conditions, such as ground water or deep lake sediments⁶.
- *Water solubility*: Generally speaking, water soluble compounds are more easily assimilated and thus pose a greater health risk^{1,6}.
- *Chemical form*: inorganic, soluble arsenic compounds are considered more toxic than organic arsenic compounds. Particles are generally less toxic than soluble forms. Arsine gas is one of the most toxic forms¹.

Along the B.C. Coast, some areas have shown elevated arsenic levels in well water, mostly attributed to naturally occurring sources as discussed above.

Well owners who wish to use their well water as a drinking water source should test for total trace elements as part of a comprehensive analysis of their water. This type of screening of private well water can detect arsenic and other potentially unhealthy trace elements before they become a health issue. Testing for total arsenic provides a conservative estimate and should be compared to the most current Canadian Drinking Water Guideline³. Presently, the Canadian Drinking Water Guidelines are based on total arsenic and are not valence-specific. Valency testing is feasible but expensive. Consequently, total arsenic testing is usually recommended as a good starting point before doing other types of arsenic analyses.



Did you know...

Stains on bathroom fixtures can be indicative of higher than normal metal content in your household water.

- Green or bluish stains indicate the presence of copper.
- Reddish or rust-coloured stains indicate iron.
- Black stains indicate zinc or manganese.
- Whitish scaly deposits in kettles or hot water tanks are indicative of hard water.
- Treatment options are numerous, and are listed in the Health Canada web site under groundwater⁷.

Further Information:

See our web site: <http://www.nilabs.com>

1: http://www.atsdr.cdc.gov/HEC/CSEM/arsenic/exposure_pathways.html

2: <http://www.ec.gc.ca/envhome.html>

3: http://www.ec.gc.ca/water/en/policy/prov/e_prov.htm#BC

4: http://www.epa.gov/safewater/ars/ars_rule_factsheet.html

5: http://www.hc-sc.gc.ca/sr-sr/finance/tsri-irst/proj/metals-metaux/tsri-313_e.html

6: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/arsenic/index_e.html

7: http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/well_water-eau_de_puits_e.html

8: <http://www.leg.bc.ca/cmt/36thParl/cmt12/2000/36-4-report02.htm>