The drop on water

Humic Substances

Humic substances are the end product of decaying organic matter.

Tannin and lignin are organic compounds similar to humic substances. Tannin is a complex organic compound found naturally in soil and in certain tree barks. Lignin is a natural compound common in woody plants and trees.

Source

Humic substances come from the accumulation and natural chemical reaction of by-products produced by the biodegradation of organic matter. They are commonly present in soils, surface water, sewage, compost heaps, marine and lake sediments, peat bogs, carbonaceous shales, and lignites.

There are three types of humic substances, which differ slightly in acidity and chemical composition. They are humic acid, fulvic acid, and humin.

Tannin is abundant in the bark, fruit, and leaves of plant material. Lignin is one of the principal constituents of the woody structure of seed plants. Tannin and lignin are part of a natural group of organic substances in soil, produced by decaying vegetation.

The main source of humic substances, tannin, and lignin is natural organic material. They may also be present in groundwater due to

- the proximity to areas underlain by coal
- the dissolution of bark mulch
- buried organic debris such as tree stumps
- the wastewaters of leather and wood-working industries (tannin and lignin)
- pulp and paper mill effluent (lignin)

QUICK FACTS

- Humic substances are the end product of decaying organic matter.
- Tannin and lignin are natural organic substances found in plants and soil.
- Humic substances, tannin, and lignin may be present in well water that is hydraulically connected to surface water, but may also be found in certain bedrock types, such as those containing coal.
- No numerical Canadian drinking water quality guidelines exist for humic substances, tannin, or lignin. Their presence may sometimes be inferred from measurement of colour and dissolved organic carbon.
- Humic substances, tannin, and lignin may affect the taste, colour, or smell of drinking water.
- * The presence of humic substances, tannin, or lignin in well water may indicate a natural benign source or the presence of other contaminants in the water.
- Several treatment options can reduce the concentration of humic substances, tannin, and lignin in drinking water.

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Humic substances, tannin, and lignin are most common in surface water and shallow groundwater hydraulically connected to surface waters or wetlands. These organic substances may occasionally be found in well water, particularly if the well is not properly constructed.

Maximum Acceptable Concentration for Drinking Water

No numerical Canadian drinking water quality guidelines exist for tannin, lignin, or humic substances. However, the presence of humic substances is addressed in Health Canada's drinking water quality guideline on colour.

Humic Substances in Drinking Water

Humic substances are not believed to be harmful to human health. At higher concentrations, humic substances can impart a characteristic yellowish to brownish colour in water, and can cause drinking water to have a bitter taste or unpleasant odour. The odour is not from the humic substances themselves. Humic acid may stimulate the growth of aquatic micro-organisms, some of which may produce an odour.

The presence of humic substances in drinking water may be due to natural organic sources, but may also indicate contamination from surface water sources. The presence of pathogens or other contaminants present in surface water may cause adverse health effects.

Humic substances can adsorb a variety of organic substances. Many metals present in drinking water can also react with humic substances in water, which can increase the concentration of metals in the water.

Tannin and Lignin in Drinking Water

Tannin and lignin can impart a yellow or light brown colour, bitter taste, and unpleasant odour in drinking water. The presence of tannin or lignin in drinking water may be from benign natural sources, but could be cause for concern if contaminants present in surface water are also present in well water.

Testing

If you suspect tannin or lignin is present in your well water, contact an accredited water testing laboratory. A specific laboratory test is necessary to identify tannin or lignin in well water. Find a list of accredited water testing laboratories at **www.gov.ns.ca/nse/water/waterlabs.asp** or see the Yellow Pages under "laboratories."

Get the special sampling bottles and instructions on proper sampling from the laboratory.

The special laboratory test for analyzing water samples for tannin or lignin can cost between $60 and $100.

Currently, no laboratories in Nova Scotia provide analysis for humic substances. However, the test results for tannin and lignin, as well as colour and dissolved organic carbon, may provide some information about the presence of humic substances in your well water. See our fact sheet on colour for more information.

Solutions

If humic substances, tannin, or lignin are suspected or found to be present in well water, it may be due to natural conditions, or may mean that the groundwater in the well is under the direct influence of surface water. To determine whether humic substances, tannin, or lignin are naturally present in the groundwater or if microbial pathogens are able to travel from nearby surface water to the groundwater source, you should

- have a water quality professional investigate the source of the contamination
- check the bacterial quality of the water
- inspect the well construction

If bacterial quality and well construction are acceptable, and there is no evidence of other contamination, treating your water is optional. You may wish to

- Obtain drinking water from an alternate source, such as bottled water or a nearby well that has been tested and found to be safe.
- Install a treatment system to improve the appearance of your water.

REGULAR TESTING

Homeowners are responsible for monitoring the quality of their well water:

- Test for bacterial quality every 6 months.
- Test for chemical quality every 2 years.
- Test more often if you notice changes in physical qualities – taste, smell, or colour.

Regular testing alerts you to problems with your drinking water.

Humic Substances

Humic Substances

Treatment

We recommend purchasing a treatment system that has been certified to meet the current NSF standards. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at **www.nsf.org**.

Although there are currently no treatment units certified specifically for the reduction of humic substances, tannin, or lignin, effective treatment methods for reducing their levels in drinking water include

- activated carbon
- anion exchange
- chlorination/filtration

The best treatment option may depend on the source of the humic substance, tannin, or lignin.

Once installed, re-test your water to ensure the treatment system is working properly. Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water.

For more information on water treatment, see our publications *Water Treatment Options* and *Maintaining Your Water Treatment*, part of the *Your Well Water* booklet series at **www.gov.ns.ca/nse/water/privatewells.asp**.

Considerations

The characteristics of iron, iron bacteria, and humic substances can be very similar in drinking water. It is important to determine which of these is causing water problems, because the treatment options are very different. Chlorine can be used to treat iron and iron bacteria, but chlorine added to water containing humic substances may contribute to the formation of trihalomethanes (THMs). For more information on THMs, see our fact sheet at **www.gov.ns.ca/nse/water/thm.asp**.

Eliminating humic substances, tannin, and lignin is extremely difficult, especially at higher concentrations.

The presence of humic substances, tannin, and lignin may also affect the efficiency of several other types of treatment units for other parameters.

FOR MORE INFORMATION

Contact
Nova Scotia Environment at
1-877-9ENVIRO
or 1-877-936-8476

www.gov.ns.ca/nse/water/

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Environment

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