

The drop on water

Coliform Bacteria

Total coliforms are a group of bacteria commonly found in the environment, for example in soil or vegetation, as well as the intestines of mammals, including humans. Total coliform bacteria are not likely to cause illness, but their presence indicates that your water supply may be vulnerable to contamination by more harmful microorganisms.

Escherichia coli (*E. coli*) is the only member of the total coliform group of bacteria that is found only in the intestines of mammals, including humans. The presence of *E. coli* in water indicates recent fecal contamination and may indicate the possible presence of disease-causing pathogens, such as bacteria, viruses, and parasites. Although most strains of *E. coli* bacteria are harmless, certain strains, such as *E. coli* O157:H7, may cause illness.

Sources

Total coliforms and *E. coli* are used as indicators to measure the degree of pollution and sanitary quality of well water, because testing for all known pathogens is a complicated and expensive process.

The main source of pathogens in drinking water is through recent contamination from human or animal waste, from

- improperly treated septic and sewage discharges
- leaching of animal manure
- stormwater runoff
- domestic animals or wildlife

During and after precipitation, bacteria and other harmful microorganisms from any of these sources may be washed into rivers, lakes, or groundwater. Poor well construction or poor maintenance can increase the risk of groundwater contamination.

QUICK FACTS

- Total coliforms are a group of different kinds of bacteria.
- Coliform bacteria are found naturally in the environment and in the intestines of humans and animals.
- *Escherichia coli* (*E. coli*) is one member of the total coliform group of bacteria. It is naturally found only in the intestines of mammals, including humans.
- The main source of *E. coli* in drinking water is through recent contact with human or animal waste.
- The Canadian drinking water quality guideline for *total coliform* is **none detectable per 100 mL**.
- The Canadian drinking water quality guideline for *Escherichia coli* (*E. coli*) is **none detectable per 100 mL**.

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Maximum Acceptable Concentration for Drinking Water = none detectable per 100 mL

In water, coliform bacteria have no taste, smell, or colour. They can only be detected through a laboratory test.

The Canadian drinking water quality guideline for **total coliforms** is **none detectable per 100 mL**. The Canadian drinking water quality guideline for *Escherichia coli* (*E. coli*) is **none detectable per 100 mL**.

This means that in order to conform to the guideline:

- For every 100 mL of drinking water tested, no total coliforms or *E. coli* should be detected.

When drinking water is tested for total coliforms and *E. coli* and the water is safe to drink, the results may be presented in a variety of formats:

- absent
- 0 colony forming units per 100 millilitres (0 CFU/100 mL)
- less than 1 colony forming unit per 100 millilitres (< 1 CFU/100 mL)
- non-detect (ND)
- 0 most probable number per 100 millilitres (MPN/100 mL) – only when a bacteria count is requested

Health Risks

E. coli in drinking water indicates the water has been contaminated with fecal material that may contain disease-causing microorganisms, such as certain bacteria, viruses, or parasites.

The health effects of exposure to disease-causing bacteria, viruses, and parasites in drinking water are varied. The most common symptoms of waterborne illness include nausea, vomiting, and diarrhea. Infants, the elderly, and those with compromised immune systems may suffer more severe effects. In extreme cases some pathogens may infect the lungs, skin, eyes, nervous system, kidneys, or liver and the effects may be more severe, chronic, or even fatal.

You should not assume that your water is safe to drink just because it has not made you sick in the past. If bacteria are present in your water, there is a risk that it could make you ill.

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.

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Testing

Regularly test your well water for a standard suite of bacterial and chemical parameters, including total coliforms and *E. coli*. Use an accredited water testing laboratory. 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. Take care when collecting the sample. See our website for basic procedures at www.gov.ns.ca/nse/water/docs/MicrobiologicalSamplingProcedure.pdf. Samples must be kept cool and be delivered to the lab within 24 hours of sampling.

The cost of analyzing water samples can range from \$20 for a single parameter to \$250 for a full suite of bacterial and chemical parameters. The cost can vary depending on the lab and the number of parameters being tested.

Test Results

If your test results found bacteria to be present, your water is not safe to drink. Retest your water to confirm the original results. Boil your water while you are waiting for your test results, or use another source for drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, and brushing your teeth.

To destroy pathogens, bring water to a rolling boil for one minute. You do not usually need to boil water for other household purposes. Those who can avoid swallowing the water may shower, bathe, and wash using the well water. Toddlers and infants should be sponge bathed. Dishes and laundry may be washed in well water either by hand or machine.

QUICK FACTS

- Coliform bacteria are used as a measure of the degree of pollution and the sanitary quality of well water.
- Coliform bacteria can be detected through laboratory testing. The lab reports the presence or absence of total coliform bacteria and *Escherichia coli* (*E. coli*).
- Do not assume that your water is safe to drink just because it has not made you sick in the past. If bacteria are present in your water, there is a risk that it could make you ill.
- If total coliform or *E. coli* are present in drinking water, consider well rehabilitation or replacement, or water treatment options.
- If bacteria are found in your water, it is not safe for drinking, preparing infant formula, preparing juices and ice cubes, washing fruits and vegetables, cooking, or brushing your teeth.

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If ***E. coli*** is present in the water, it means there has been recent fecal contamination and other pathogens may be present. Investigate the source of the bacteria and take corrective measures.

If ***E. coli*** is absent, but only **total coliforms are present**, it could mean one of three things:

- A layer of bacteria may have developed within your well or plumbing system. This layer of bacteria is called a biofilm.
- Surface water may be getting into your well. This increases the risk of animal waste contaminating your water sooner or later.
- Your well water may come from an aquifer that contains bacteria. This can happen when groundwater comes from a shallow source.

Boiling Water

To kill microorganisms, you must keep water at a rolling boil for at least one minute. Water can be boiled either in a pot or kettle on a stove, in a microwave oven, or in an electric kettle without an automatic shut-off.

Solutions

If *E. coli* is confirmed to be present in the well water:

- Inspect the well construction and repair or rehabilitate the existing well. Check separation distances between wells and sources of contamination. Determine if there is a source of *E. coli* near your well, such as a malfunctioning septic system. Table 1 shows the minimum distances that must be maintained according to the Nova Scotia Well Construction Regulations. For more information, see the Nova Scotia Well Construction Regulations at www.gov.ns.ca/just/regulations/regs/envwellc.htm. Reconstruct the existing well, if necessary. In some cases it may be necessary to properly decommission the existing well and construct a new well. See our fact sheet on well decommissioning for more information.

If you boil water in a microwave, include a glass rod or wooden or plastic stir stick in the container to provide sites for bubble formation. This prevents the formation of superheated water.

- In the interim, use water that has been properly boiled, bottled water, or another source of water that has been tested and found to be safe for
 - drinking
 - preparing infant formula
 - preparing juices or ice cubes
 - washing fruits and vegetables
 - cooking
 - brushing your teeth
- Install a treatment system to treat your current source of water if there is no other source of water available and correction of the problem is not possible.

Table 1
Separation Distances Required by the Well Construction Regulations

Source of Potential Contamination	Type of Well	Minimum Distance from Well
cesspool (receiving raw sewage)	drilled well or dug well	61 m
on-site sewage disposal system	drilled well	15.2 m
	dug well	30.5 m
sewer of tightly jointed pipe or equivalent material, sewer-connected foundation or floor drain, or water treatment discharge point	drilled well	15.2 m
	dug well	30.5 m
sewer with secondary containment, roof drainage discharge point, non-sewer-connected foundation or floor drain, or cistern	drilled well or dug well	3 m
pumphouse floor drain	drilled well or dug well	610 mm
above-ground petroleum storage tank system with a capacity of 1200 L or less	drilled well	5 m
	dug well	15.2 m
above-ground petroleum tank storage system with a capacity of greater than 1200 L	drilled well or dug well	15.2 m
underground petroleum storage tank system	drilled well or dug well	15.2 m
outer boundary of any public road or public highway	drilled well or dug well	6.1 m
solid waste management facility, landfill, former dump site, or other significant source of potential contamination	drilled well or dug well	61 m

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If *E. coli* is absent, but only **total coliforms are present**, solutions depend on why total coliforms are present:

- If a biofilm has developed within your well or plumbing system, you can disinfect your well and plumbing system.
- If surface water is getting into your well, you need to identify how surface water is entering your well and prevent this from happening. You may need the help of a well specialist.
- If your well water comes from an aquifer that contains bacteria, which can happen when groundwater comes from a shallow source, you have two options:
 - Drill a deeper well, which may solve the problem. Be sure to meet the separation distances outlined in Table 1 and properly decommission your old well.
 - Install a treatment system.

Compare the cost of drilling a new well to the long-term cost of buying and maintaining a treatment system. For more information on maintaining a safe drinking water supply, see the *Your Well Water* booklet series at www.gov.ns.ca/nse/water/privatewells.asp.



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Treatment

Bacteria cannot be removed from water with pitcher-type carbon filters. Bacteria can be removed by keeping water at a rolling boil for at least one minute.

Effective treatment methods for microbial contamination include

- permanent point-of-entry disinfection units, which can use
 - chlorine
 - ozone
 - ultraviolet light (UV light)
- distillation

Buy a treatment system that has been certified to meet the current NSF standards for the inactivation of bacteria. 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.

An ultraviolet light unit purchased for the inactivation of pathogenic microorganisms must be certified to NSF Standard 55 Class A. Units without the Class A designation are only intended to be used for the reduction of non-pathogenic, nuisance organisms. Ultraviolet lights are intended for water that is visually clear (that is, not coloured, cloudy, or turbid). If the water is turbid, it should be filtered first to clarify the water.

Once installed, re-test your water to ensure that the treatment system is working properly. Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water. Testing should be conducted every three months for supplies that are contaminated with bacteria.

For more information on water treatment, see our publications *Fixing Bacterial Quality*, *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.

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Prevention

Tips for preventing bacteria, and other unwanted organisms, from entering a well:

- Make sure that the well casing is watertight and extends 152 millimeters (6 inches) or more above ground.
- Ensure the well has a proper vermin-proof cap.
- Disinfect the well, pump, and plumbing after repairs.
- Disinfect any water placed in a well for drilling, repair, or priming of pumps. Never use water from a lake or pond in your well.
- Keep pumps, well pipes, and well equipment off the ground when they are being repaired—laying them on the ground can cause them to become contaminated with bacteria.

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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03.2009