

Bacteria in Water Supplies Part 1: Problem Bacteria and How to Test for Them

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Introduction

Bacteria are single-celled organisms commonly found in soil, on our bodies, on leaf material and in water. There may be over a million cells per gram of soil. Bacteria serve many functions in nature. They help break down matter (decomposition) and transform it through chemical reactions.

"Pathogenic" bacteria can cause diseases such as typhoid, dysentery and cholera. If these bacteria are in drinking water, they can cause serious health problems. In one instance, in Missouri, four people died and 243 people became seriously ill from drinking water with a dangerous strain of *Escherichia coli* (Geldreich et al., 1992).

While surface waters commonly support bacteria, most groundwater supplies don't. This is because the conditions for bacterial growth (food, oxygen, warm temperatures and favorable pH) are not often found in groundwater. Yet many well water samples still show bacteria are present. Bacteria are the most common contaminants found in drinking water wells in Maine.

In this fact sheet, we explain how bacteria can get into your water supply and how to test your water for bacterial contamination (part 1). In part 2 of this series, we explain how to safely disinfect a well.

Types of Bacteria

Any of several thousand types of bacteria (both non-pathogenic and pathogenic) can contaminate your water supply. Water testing labs use a single procedure, the total coliform bacteria test, to find out whether the water is free of bacteria. First, they filter a water sample and incubate it. If bacteria are there, they will grow under ideal lab conditions. After incubation, the colonies of bacteria are counted.

Most coliform bacteria do not transmit diseases but they are a very common group of bacteria. They are used as an indicator that harmful bacteria may be present. If there are coliform bacteria present in the water supply (one or more colonies/100 milliliters of water, as indicated on the total coliform analysis), then the water is declared unsafe to drink. If your sample comes back with high coliform counts, this means that the water entering the well is not being filtered enough by the soil. Here are some ways contaminated water may enter a well:

- Water may leak in through a loose or cracked cover.
- Water may flow down the side of the well casing without being filtered by the soil.
- Water may come through the side of a dug well (without adequate soil filtration).
- Bacteria may be added when a well is repaired.

- The groundwater supplying the well may be contaminated with bacteria.

The most important thing to remember is this: **If your well is properly constructed and the quality of water feeding the well is free of bacteria, you should have no coliform bacteria in the well.**

If total coliform bacteria are present, the Health and Environmental Testing Lab (HETL) will check for *E. coli* bacteria also. These bacteria come from the gut of warm-blooded animals. If they are present, there's a chance that animal or human waste is entering your water supply. You'll need to find out the source. You may need to test for detergents to find out if septic waste is the culprit.

Whatever the bacterial source, do not drink water with any coliform bacteria present. The water supply may have disease-causing organisms. Your only alternative is to boil the water for at least a minute before cooking or drinking (Plowman, 1989).

Bacteria Tests

If you have a private source of water (drilled or dug well or spring), it is up to you, as the homeowner, to test the water. Dug wells and springs are more likely to be contaminated than drilled wells. The main reason is that they may not be well built. Dug wells may collect water that has not moved through enough soil to naturally filter out the bacteria. However, drilled wells can be contaminated, too. A drilled well may not be well sealed into the bedrock, or have water flowing down the side of the well casing.

You should test your well every year for bacteria. The cheapest test is a simple bacterial test from the Health

and Environmental Testing Lab in Augusta (In 2001, this test cost \$12.) Water test A (a \$20 test) gives information on bacteria, plus nitrates and nitrites. It covers all major water quality problems that have an acute or short-term health effect on humans. All other contaminants generally have a long-term effect on human health.

A more complete test is water test B (\$40). This provides you with data on bacteria and nitrates (nitrites) plus pH, iron, manganese, hardness, chloride and fluoride. Use this test every couple of years to keep a record on your water supply quality.

If there are noticeable changes in color, smell, or if anyone in your family has had chronic illness, it would be good to test the water for bacteria. Also, if your well has been flooded or repaired, it is important to test the well for bacteria (Mancel et al., 1991).

How to Test for Bacteria

These are the steps to test your well for bacteria:

1. Call the Health and Environmental Testing Lab in Augusta (207-287-1716) and request either bacteria test, Test A or Test B.
2. When you get the test kit, open it and read the directions carefully.
3. If there is a filter on your kitchen sink faucet, remove it and let the water run for five minutes.
4. Fill out the paperwork while the water is running.
5. Carefully unscrew the sample bottle and fill to the top with water. Then, replace the cap without touching the inside of the cap or the rim.

6. Write a check and put it with paperwork into the sample test kit.
7. Mail the water sample, completed papers and check to the Health and Environmental Testing Lab right away.

These are the important steps for a good water test. If you use another lab, make sure it is a state-certified lab. Water treatment companies will often offer free on-site water testing, but no one can test for bacteria on site.

Understanding Water Test Results

You will receive water test results in the mail. Depending on which test you do, it may take a few days to a few weeks to get the results. If you suspect that your water is contaminated, do not drink the water without boiling it, or drink bottled water.

Your bacteria test results will tell you colonies of bacteria per 100 milliliters of water. If you have one or more colonies, the water will have to be disinfected. (See Bulletin #7115, "Bacteria in Water Supplies, Part 2: How to Disinfect Your Well".) If you have a lot of bacteria, the lab will report this as "TNTC" or too numerous to count.

If your water sample comes back with 0 colonies/100 milliliter, your water should be safe to drink. The water is coming from a water source free of bacterial contaminants, and the well is apparently sound.

Other Bacterial Problems

Another major bacterial problem comes from iron bacteria. Iron bacteria are common organisms that cause water quality problems. They are not

pathogenic (disease-carrying) bacteria, but cause some nuisance problems. These organisms often form a grayish or red/orange gelatinous material in pipes, toilets and wells. Hydrogen sulfide gas is often a byproduct of these organisms. It gives your water a distinctive rotten egg odor.

Hydrogen sulfide gas is in the water if you detect a sulfur smell. Use Test I from HETL (\$25). This test will determine if you have iron bacteria in your water. Iron bacteria is treated with a disinfectant (see Bulletin #7115, "Bacteria in Water Supplies, Part 2: How to Disinfect Your Well").

Testing Swimming Water for Bacteria

There are also tests to determine bacteria levels in swimming pools, rivers and lakes. One \$24 test, Test K from the Health and Environmental Testing Lab in Augusta, measures fecal coliform bacteria against state standards for swimming.

For more information on water quality, water testing or other issues contact your county office of the University of Maine Cooperative Extension.

For more information on treating bacterial contamination, request a copy of Bulletin #7115, "Bacteria in Water Supplies, Part 2: How to Disinfect Your Well."

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