Bacteriological Contamination of Drinking Water

Wisconsin’s groundwater is normally free from bacteria, which are filtered out of water as it percolates down through the soil. Groundwater in certain localities can become bacteriologically contaminated when there is insufficient filtration between the land surface and the groundwater. Surface water can also enter the ground through rock outcroppings, sinkholes, quarries or abandoned wells in the area of a drinking water well, contaminating the groundwater aquifer supplying the well.

A properly constructed, deeply cased well, seals the well to a depth at which bacteria have been filtered out. Water at these depths is usually free from contamination.

How can my well become contaminated?

Your well may become bacteriologically contaminated for one of the following reasons:

1. There is a source of contamination too close to the well or the well casing isn’t deep enough to assure that recharge water receives sufficient filtration to remove bacteria.

2. The well may be constructed using poor sanitary practices. New wells often show contamination because during drilling of the well, the drillhole was contaminated through use of dirty tools, pipe and drilling water. New piping, pump or pressure system components also may cause contamination if they are generally soiled and not disinfected prior to use, assembly or installation. The state well code requires disinfection of new wells, pumping equipment and water systems prior to use.

3. Contaminated surface water or groundwater enters an improperly constructed well (for example):
   a. Dug wells walled up with boards, brick, stone or tile sections, permit unfiltered surface water and nearsurface waters to seep into the well through the cracks.
   b. Casing improperly sealed into the rock and/or unconsolidated geological formation may permit surface water or contaminated groundwater to move vertically downward, contaminating good aquifers.
   c. Surface water enters the top of the well because the casing doesn’t extend far enough above the ground or a hand pump base isn’t sealed watertight on the casing.
   d. The well top ends in a nonconforming well pit subject to flooding or seepage of contaminated groundwater.
   e. Old well casings may rust through, leaving holes near the ground surface where surface water or nearsurface waters can seep in and contaminate deeper groundwater.

4. The aquifer supplying the well is fractured rock, which has poor water-filtering properties.
When should I test my well for bacteriological contamination?

All new wells must be tested for bacteriological quality. It is advisable to recheck wells annually or after modifying them in any way. Wells should also be tested when any change in taste, odor or appearance is noticed.

Where can I obtain a sampling kit for bacteriological testing?

A test kit (including sampling instructions) may be obtained for a fee from the State Laboratory of Hygiene at the address listed below, or from any certified private laboratory. Make sure to follow all instructions carefully.

What should I do if an unsafe sample results?

1. Resample. A second sample must be taken to confirm your first unsafe result. Be sure to use the proper sampling procedure in taking the sample because it will help you determine if your original unsafe sample was due to human error in sampling.

2. If the second sample results are unsafe, do not consume the water unless it is boiled at a rolling boil for at least 5 minutes.

3. If you can find no obvious sources of well contamination, your water system should be disinfected by a qualified individual (well driller, pump installer or owner).

4. If you find obvious sources for well contamination or disinfection is unsuccessful, contact your local well driller, pump installer or DNR District Water Supply staff for assistance as listed below.

For assistance with well or pump work or chlorination, contact a registered well driller or pump installer (see telephone yellow pages under Well Drilling, Pumps or Water Supply Systems). For further assistance, you may call DNR District Staff, County Sanitarians or Health Departments.

What do the results of this test tell me?

Bacteriological examinations are made to determine the suitability of water for drinking and food preparation uses. When a sample is reported "safe bacteriologically," coliform organisms (a group of indicator bacteria) were not found in the sample. If the sample was taken according to directions enclosed with the water sampling kit, you can be reasonably sure that the water is suitable for drinking and general domestic use. When a sample is reported "unsafe bacteriologically," coliform bacteria were found in your sample. Coliform bacteria are found in the feces and excreta of man and other animals as well as in surface water. Their presence in groundwater (wells) shows that unfiltered or poorly filtered surface water or near-surface waters have found their way into the groundwater or entered through an opening in, around or at the top of the well casing. This indicates that the water is potentially dangerous and should not be consumed unless boiled. If additional help is needed in interpreting the lab results, contact the water Microbiology Unit, State Laboratory of Hygiene, 2601 Agriculture Dr., Madison, WI 53707 (Tel: 608 224-6262) or your local DNR district water supply specialist.

How can I locate possible sources of pollution?

Before you attempt to locate the source of contamination for an unsafe well, be certain that the instructions for collecting water samples were followed closely. If they were not or you're uncertain, another sample should be collected following instructions closely. When sampling error has been ruled out, the surrounding area should be inspected for possible pollution sources. These would include openings at the top of a well; old, rusty or damaged well casings; improper well casing installation; faulty pump installation; close proximity of a well to septic tanks, tile fields, sewers, kitchen sinks, drains, privies, barnyards, animal feed lots, abandoned wells, rock outcroppings, sink holes and quarries. If any of the above are found to cause contamination problems, the proper changes or repairs must be made. Qualified plumbers, well drillers, pump installers, DNR water supply specialists or county sanitarians can assist you in making these observations and recommending improvements.
How can I disinfect my water system?

New wells and wells that are bacteriologically contaminated should be disinfected according to the following steps:

1. Determine the amount of chlorine solution (prepared in step 2) needed to displace the volume of water in the well using the following information.

<table>
<thead>
<tr>
<th>Casing diameter</th>
<th>Minimum amount of chlorine solution to displace the volume of water in the well</th>
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<tbody>
<tr>
<td>2&quot;</td>
<td>Prepare 2 gallons of chlorine solution per 10 feet of well depth</td>
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<tr>
<td>4&quot;</td>
<td>Prepare 7 gallons of chlorine solution for every 10 feet of well depth</td>
</tr>
<tr>
<td>6&quot;</td>
<td>Prepare 15 gallons of chlorine solution for every 10 feet of well depth</td>
</tr>
<tr>
<td>8&quot;</td>
<td>Prepare 26 gallons of chlorine solution for every 10 feet of well depth</td>
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</tbody>
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2. To prepare the chlorine solution, mix 1 unit volume of household laundry bleach with 100 units volumes of water. For example, mix 1 gallon of bleach with 100 gallons of water. Prepare enough solution to meet or exceed the total volume of your well. Mixing can be done 25 gallons at a time in a new garbage can. Note: Never use (even new) garbage cans to store drinking water.
3. Remove the cap from the well and pour the entire bleach and water mixture into the well.

4. Rinse down the sides of the well casing with a garden hose for 5-10 minutes. Make sure the hose is connected to the system being chlorinated. This procedure circulates the chlorine solution throughout the water system to insure total disinfection.

5. To disinfect your plumbing system, you can turn on each of your water taps until the bleach smell is just detected and then turn them off. You should turn off the heating element in your water heater to save energy during this process.

6. Let the chlorine solution remain in the system for at least 24 hours.

7. Pump all of the chlorine solution out of the well by attaching a garden hose and running the water to an area where the chlorine will do no damage. Remember that chlorine can kill grass and fish. Do not dump the spent chlorine solution into your private septic system and check with your municipality before dumping into any public sewer system. Pump until you can no longer detect the chlorine smell. If necessary, follow this procedure for your plumbing system by running each of the cold water taps.

8. The well should be resampled only after all traces of chlorine have been flushed from the system.

For further information on chlorination and bacteriological contamination of drinking water supplies, contact the appropriate DNR district office for your area.