PRIVATE DRINKING WATER IN CONNECTICUT

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Publication No. 4: Bacteria in Private Drinking Water Wells

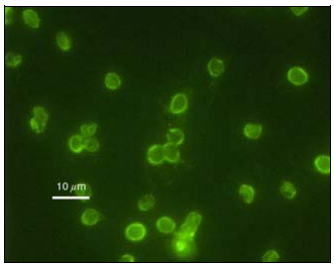
The U.S. Environmental Protection Agency (EPA) does not regulate private wells. Private well owners are responsible for the quality of their drinking water. Homeowners with private wells are generally not required to test their drinking water. However, they can use the public drinking water standards as guidelines to ensure drinking water quality. Refer to Publication # 23 *Drinking Water Standards* for more information

The Maximum Contaminant Level (MCL) for bacteria in drinking water is zero total coliform colonies per 100 milliliters of water as established by the EPA. The total coliform test is the basic yardstick for determining the biological quality in a water supply. The test is easy to perform, inexpensive, and errs on the side of caution. The organisms in the total coliform group are called indicator organisms. The presence of coliform bacteria in drinking water indicates that a pathway for disease producing (pathogenic) organisms exists. There may or may not be pathogenic organisms in the drinking water, but you must eliminate the potential pathway to prevent them from entering the well.

Introduction

Coliform bacteria occur naturally in the environment. If a water test indicates the presence of coliform bacteria, the next step is to attempt to identify and eliminate the pathway of contamination. Boiling, chlorination, ultraviolet light, microfiltration, and distillation are treatment options for removing the bacteria. Bottled water is an alternative for drinking and cooking until the problem can be corrected.

Potential Health Effects



Health symptoms may include diarrhea, cramps, nausea, possible jaundice, and associated headaches and fatigue. (These symptoms, however, may be caused by a number of other factors not associated with bacteria in drinking water.) Water contaminated with bacteria should not be used for drinking or cooking unless you bring it to a rolling boil for a minimum of one minute or the water is disinfected by other means (see Chlorination below).

Indications of Bacteria in Drinking Water

Bacterial contamination cannot be detected by sight, smell, or taste. The only way to know if a water supply contains coliform bacteria is to have it tested. In addition, there are sulfur-reducing bacteria that can be present in deep wells. If present in high concentrations, these bacteria can cause the well water to have a rotten egg smell. If iron bacteria are present, they can give a musty odor to the water and give the water a brownish tint. Sulfur/iron bacteria are not coliforms so they must be tested for separately.

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Testing for Bacteria in Private Drinking Water Wells

The primary test to determine the presence of bacteria is the total coliform test. To determine if bacteria are present, arrange to test your drinking water at a state certified laboratory. Follow laboratory instructions carefully to avoid contamination and obtain a good sample. Before collecting the sample; flush the pressure tank, by-pass all treatment, and remove the faucet aerator. Run the cold water for several minutes and then collect your sample. Test your well water for bacteria under the following conditions:

- At least annually (preferably semi-annually, spring/fall).
- When a new well is constructed.
- When an existing well is returned to service. If the home has been unoccupied for a while, flush the water storage tank and allow the water to run for about 20 minutes with the faucet open fully before collecting the sample.
- Anytime a component of the water system is opened for repair. This includes the well, pump, pressure tank, piping, and any other components that your drinking water comes into contact.
- Whenever flood waters or surface runoff inundates the well.
- Whenever you suspect bacterial contamination, as might be indicated by continuing illness in the house.
- When a state certified laboratory test indicates nitrate concentrations above 10 milligrams per liter or any other nitrogen components increase and human or livestock waste is the suspected cause.

Lending agencies often require at least a total coliform test for homes relying on private water supplies before the sale of property or approving a new or refinanced home loan.

If Water Tests Indicate the Presence of Coliform Bacteria

If a water test indicates the presence of coliform bacteria, you should not drink the water or use it for cooking, brushing teeth, etc. The next step is to attempt to identify and eliminate the source of contamination. If you are unable to locate and eliminate the bacteria source and cannot afford a new well, you may need a long-term treatment method. Overall, long-term treatment methods may result in being the most expensive alternative due to continuous operation and maintenance costs.

As you attempt to find the source of contamination, evaluate both well location and well construction. Check the entire water distribution system for potential problem areas, including a garden hose without proper backflow prevention.

Well location is a crucial safety factor. A well that is downhill from a source of bacterial contamination runs a greater risk of contamination that a well on the uphill side of the pollution source. Good well location requires minimum separation distances from sources of potential contamination, using the natural protection provided by soil filtration. Contact a registered well driller or pump installer for all well maintenance or repairs.

Sources of Bacteria in Drinking Water

Most coliforms are harmless bacteria that are found in large numbers in the intestines and feces of warm-blooded animals and occur naturally in soil and vegetation. While most coliform bacteria are not harmful, their presence indicates the possible existence of pathogens in the water supply. Coliform bacteria should not be present in a properly constructed well. When looking for potential pathways for coliform intrusion, the following sources should be investigated:

Human Waste associated with malfunctioning septic systems and leaking sewer pipes have been identified as a potential source of bacterial contamination to a drinking water well. A septic system located too close

can physically trap bacteria as it moves and once over a distance of 75 feet, the bacteria will die in unsaturated soil conditions.

Animal waste is a common source of bacteria in water. These sources of bacterial contamination include runoff from feedlots, pastures, dog runs, and other land areas containing other animal wastes. Bacteria from these sources can enter wells that are open at the land surface, that lack water-tight casings or caps that are shallow, or do not have a grout seal in the annular space (the space between the wall of a drilled well and the outside of the well casing).

Insects, rodents or other animals entering the well are also potential sources of contamination. Dug wells usually have large access openings and casings that may not be properly sealed. This makes it easy for insects, rodents, or other animals to enter the well.

Inundation or infiltration of the well by floodwaters and surface water runoff can result in high levels of bacterial contamination to the water supply. Even small depressions around the wellhead that fill with surface runoff provide an excellent breeding ground for bacteria. Bacteria can easily enter your water supply when the well is shallow and/or the well casing is not properly sealed and watertight. This is especially a risk in sandy soils.

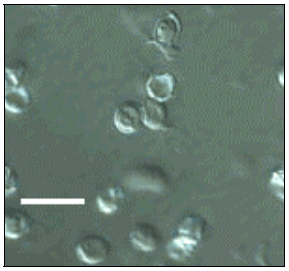
Older wells and water sources, especially dug wells, spring-fed systems and cistern-type systems are very vulnerable to coliform bacteria and other pathogenic contaminants. Any systems with casings or caps that are not watertight, or lack a grout seal in the annular space, are vulnerable. This is particularly true if the well is located where surface runoff can accumulate and enter the well. During the last five to ten years, well and water distribution system construction has improved to the point where bacterial contamination due to poor well construction is rare in newer wells.

Corrective Action

The immediate remedy is to disinfect the well with chlorine bleach; however, disinfection may only be a temporary remedy. The most important consideration is to find and eliminate the source of the contamination. Most bacterial problems are caused by improper well construction and/or may have been introduced during well maintenance or repair. Faulty construction can often be corrected to fix the problem. Some examples include:

- Replacing a leaky well cap or dug well cover
- Repairing a malfunctioning septic system
- Diverting surface water away from the well
- Renovating/deepening the well
- Drilling another well to obtain a safe supply from a deeper level of groundwater
- Removing livestock or pets from the well area

Chlorination



Chlorination can be an effective method to kill bacteria. Chlorinate when a well is new, repaired, or contaminated with bacteria. Use household chlorine bleach that does not have scents or other additives. Disinfect the well as outlined below:

- New well: 1.5 quarts of household chlorine bleach per 100 feet of well depth.
- Existing well: 1 pint of household chlorine bleach (all well depths).

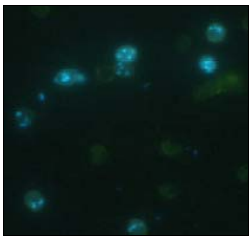
1. Mix the appropriate amount of household chlorine bleach with 5 gallons of water and pour in the well through the top of the well casing.

2. Run the water at each and every (hot & cold) faucet, including the outdoor faucet, until a chlorine odor is detected. If no chlorine odor is detected, repeat step 1 above until a chlorine odor is detected at each tap. If you have a refrigerator with an automatic icemaker and cold-water dispenser, you should also flush those until a chlorine odor is noted.
3. Close the faucets and allow the chlorinated water to remain in the well and piping system for at least 3 hours, preferably overnight.
4. Run the water at each and every faucet until no chlorine odor is detected. Flush every cold and hot water tanks as well to remove any oxidized sediments.
5. Wait at least 24 hours after no chlorine odor is detected before collecting samples for analysis

If bacteriological problems persist following chlorination, you have not successfully eliminated the source of contamination.

Chlorination, however, does have its limitations. Chlorine solutions are only moderately stable, organic matter as well as iron and manganese consumes chlorine. High chlorine concentrations have objectionable tastes and odors, and even low chlorine concentrations may have objectionable tastes and odors for some people. Chlorine use can also react with organic material to form trihalomethanes. Yet in spite of these factors, chlorination is widely used on small private water systems to ensure bacteriologically safe drinking water systems.

Long-term Home Water Treatment



All efforts should be made to identify and eliminate the source of bacteria. If the problem is due to a failing septic system, improper well maintenance, or proximity of the well to animal pens, consider the costs of improving these situations over the long term versus long-term water treatment. If you cannot identify and correct the bacteria source, then there are home water treatment options available to you. These include ultraviolet radiation, distillation, ozonation, and microfiltration. For more information on these treatment options, please see Publications:

Publication #7 *Distillation*
Publication #14 *Microfiltration Treatment of Drinking Water Systems*
Publication #17 *Ozone Treatment of Private Drinking Water Systems*
Publication #25 *Ultraviolet Radiation Treatment of Private Drinking Water Systems*

Regardless of the quality of the equipment purchased, it will not operate unless maintained in accordance with the manufacturer's recommendations. Keep a logbook to record equipment maintenance and repairs. Equipment maintenance may include periodic cleaning and replacement of some components. Also consider any special installation requirements that may add to the equipment costs. For more information, refer to Publication #19 *Questions to Ask When Purchasing Home Water Treatment Equipment*.

Protection of Private Drinking Water Supplies

You can protect your private well by paying careful attention to what you do in and around your home as well as your neighbor's activities near your well. Regular testing and adopting practices to prevent contamination can help ensure that your well supplies you and your family with good quality drinking water. For more information on well protection see Well Publication #26 *Private Drinking Water Wells.*

For more information please click on the following links:
EPA Office of Groundwater and Drinking Water
http://www.epa.gov/ogwdw/
EPA New England
http://www.epa.gov/region01/

Adapted from *Healthy Drinking Waters for Rhode Islanders*, University of Rhode Island Cooperative Extension, *April 2003*.