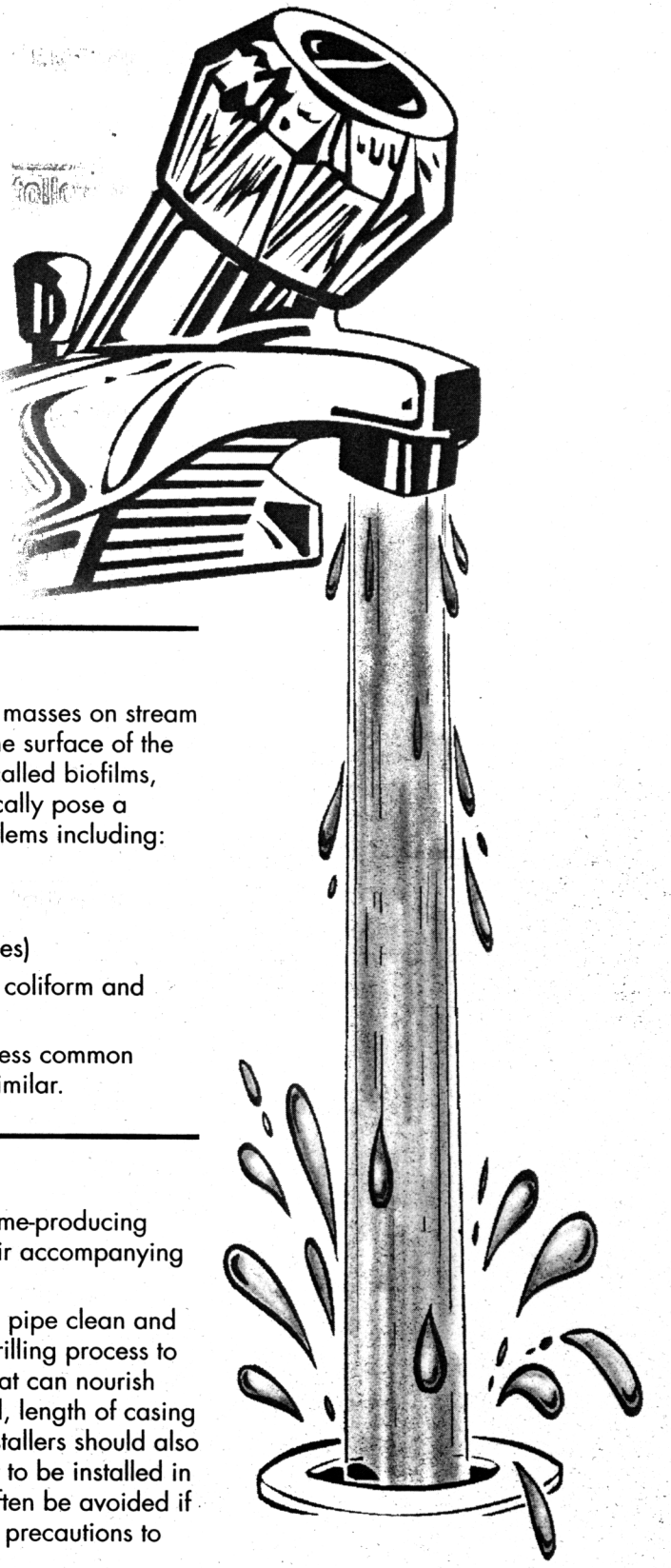
Iron Bacteria Problems In Wells

Because water is the universal solvent, groundwater usually has some characteristics of the soil and bedrock it flows through. Iron is one of the most abundant elements in the earth's crust so it is very common in groundwater. You may be familiar with what can happen when there is too much iron in well water – the water often has a metallic taste, a reddish-brown color, stains the laundry and makes poor tasting coffee.

An equally common but less understood problem is the infestation of a well and water system with iron bacteria. These and similar slime-producing bacteria are a natural part of the environment. They can combine oxygen with iron, manganese or other nutrients in the water and produce a slime that builds up on well screens, pipes, and plumbing fixtures. Wells used infrequently or intermittently tend to be more prone to these problems.

This brochure offers information on the nature of an iron bacteria problem, how you can prevent it and what you can do if it shows up in your water system.



Effects of iron bacteria

Iron bacteria can sometimes be seen as reddish or brown slimy masses on stream bottoms and lakeshores. They often produce an oily sheen on the surface of the water. More serious problems occur when these slimy masses, called biofilms, build up in wells and water systems. These bacteria do not typically pose a health concern but they often create unpleasant and costly problems including:

- Odors
- Corrosion of plumbing equipment
- Reduction of well yields (clogged screens, pipes and fixtures)
- Increased infestations of other types of bacteria, including coliform and sulfur reducing bacteria

You may also wish to consult the DNR brochure describing the less common problem of sulfur bacteria, since the causes and remedies are similar.

Preventing iron bacteria

Because it is difficult to totally rid a well and water system of slime-producing bacteria, prevention is the best safeguard against them and their accompanying problems.

Well Drillers should keep drill bits, pumps and lengths of casing pipe clean and up off the ground. All precautions should be taken during the drilling process to prevent the introduction of these bacteria or organic material that can nourish them. Prevention includes making sure that any construction tool, length of casing pipe or screen that goes into the ground is kept clean. Pump Installers should also make sure that the pump, pump piping, or any other equipment to be installed in the well, is free of contamination. Iron bacteria problems can often be avoided if both the Licensed Well Driller and Pump Installer take adequate precautions to keep the new well "clean."

When construction of a well or the installation of a pump is completed, the well must be test pumped, chlorinated and flushed. Following these procedures, the Well Driller or Pump Installer must collect a sample to be tested for coliform bacteria at a certified lab. If the sample result is negative, the water is considered bacteriologically safe to drink. A negative result is a good indication that proper well construction and pump installation procedures were used. It also means that infestations of iron bacteria are less likely to be a problem in your water system.

Detecting iron bacteria

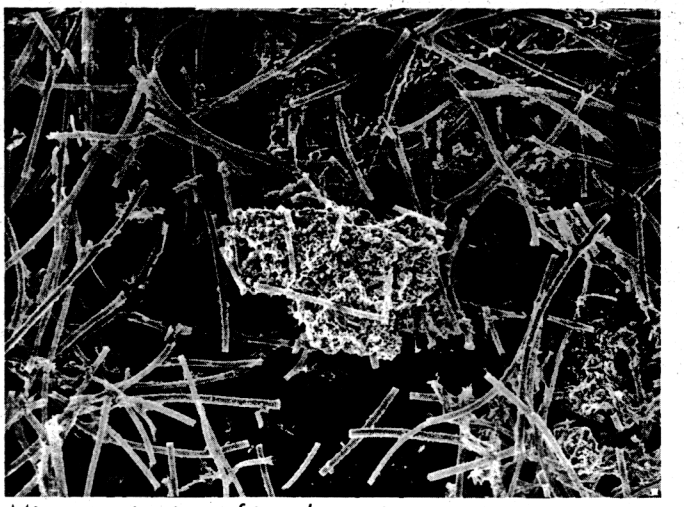
Water containing iron bacteria can have a red, yellow or orange color and can produce an oily sheen on the surface. The water may have an odor that resembles rotten eggs, fuel oil, cucumber or occasionally even sewage. The smell may be noticeable only in the morning or after long periods of time when the well has not been used. You may also notice slimy chunks of material on faucet screens or in your bathtub. If the water yield of your well decreases unexplainably, it may be the result of a significant growth of iron bacteria and the slimes they produce.

If you have reason to suspect these problems, you may wish to have your well treated, cleaned and flushed — as described later in this brochure — before sending a water sample to a laboratory to check for iron bacteria.

A quick and easy way to check for the presence of iron and other slime-producing bacteria is to look in the water closet tank of your toilet. If you see an oily sheen on the surface of the water and can feel a slimy residue on the inside of the tank, at the air/water interface, slime-producing bacteria are likely present in your water system. (If you use a disinfectant in your toilet tank, evidence of these conditions might not be so apparent.) If there are slimy deposits in the tank, you can assume you have a biofilm problem. However, if you wish, you can collect a water sample and send it to a certified laboratory to confirm their presence.

Testing your water for iron bacteria

Some laboratories provide bottles and instructions to allow you to sample for iron bacteria. You may check your local yellow business directory, under "Laboratories – Testing." Upon request you will receive a test kit. Collect the sample in the container provided by the laboratory with water taken directly from the sample tap near your pressure tank. Concentrations of iron bacteria can change constantly because their slime deposits are periodically shed from pipes and fixtures. For this reason, faucet samples should be collected early in the morning or when the water system has been inactive for at least several hours. Laboratory analysis results are usually reported out in two to three weeks.



Microscopic view of iron bacteria.

Photo from *Primer On Microbial Problems In Water Wells*, courtesy of Stuart A. Smith, MS, CGWP.

Treating minor iron bacteria problems

In areas where slime-producing bacteria are a problem, it is important for well owners to be especially alert for signs of their presence. It is much easier to treat these problems early on, before they become severe. For minor infestations owners can periodically chlorinate their well, as necessary. This can be done using department-approved products to make a water/chlorine solution as described below:

Disinfecting your well

Since knowledge and experience are important, the Department recommends you hire a Licensed Well Driller or Pump Installer to disinfect your well. However, if you decide to do a standard chlorination yourself, make sure you follow all safety precautions and closely adhere to the following steps:

1. Calculate the volume of water necessary to mix a chlorine solution that will equal or exceed the volume of water standing within the well. (This will help ensure the chlorination will disinfect the entire water column, the well and the geologic formation surrounding it.) You can determine the volume of water standing in your well by first subtracting the depth to the water in the well (static water level) from the total depth of the well. This will give you the length of the standing water column in the well. Then multiply this calculated length of water column by one of the following 'volume factors' — based on the diameter of your well. Each foot of standing water in the well will contain about:

- 8-inch diameter well: 2 1/2 gallons
- 6-inch diameter well: 1 1/2 gallons
- 5-inch diameter well: 1 gallon
- 4-inch diameter well: 2/3 gallon
- 2-inch diameter well: 3/4 quart

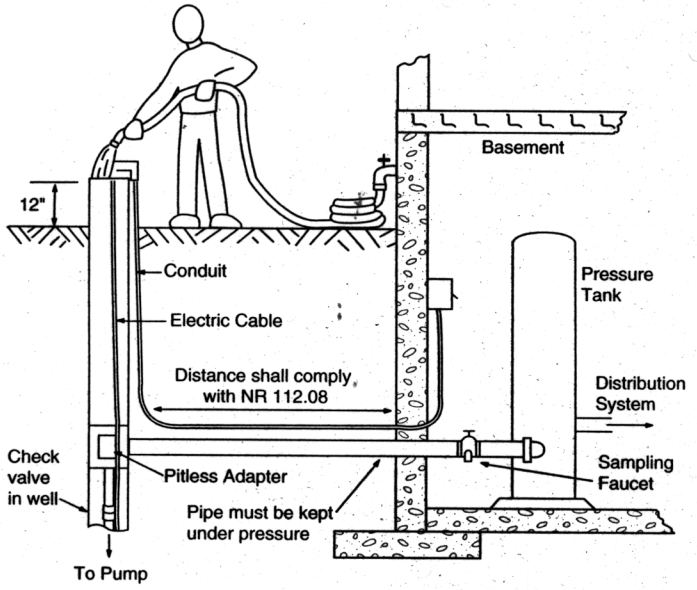
(If the total volume of water in the well is not known, 100 gallons is, for most cases, a reasonably good estimate. Most trash cans hold about 30 gallons so filling three new plastic trashcans may be sufficient.)

2. Prepare the chlorine solution by adding approximately a quart of 5.25 % (or a half quart of 10 %) household chlorine bleach to the volume of water you calculated in Step 1. The chlorine product must be free of additives, such as "fresh scent." Thoroughly mix the bleach with the water to make the solution. [Be careful not to breathe the bleach fumes. Also, never combine bleach and ammonia products because doing so will create toxic chlorine gas.]

3. **After turning off the electrical power to the pump**, remove the well cap or seal and pour the entire chlorine solution down the well, in one continuous and rapid pour. **Avoid pouring the solution onto the electrical pump wires.**

4. With the electrical power off, drain and flush the pressure tank and water heater. Then turn the electrical power back on and allow the chlorine solution to refill both tanks. Turn the water heater back on and increase the temperature setting up to 160 degrees, but **only** if the heater has a working pressure relief valve. **Caution: Use your hot water carefully at this scalding temperature setting**.

5. Attach a clean hose to a nearby faucet and place the other end down into the top of the well. Open the faucet connected to the hose and recirculate the chlorinated solution back down the well for about an hour. Make sure you wash down the entire inside of the casing and the exposed pump piping. Open all the faucets in your house until you can detect a chlorine smell. Then close them. This will disinfect the entire plumbing system. It is a good idea to bypass your water softener or any other water treatment unit by closing the valve preceding it. The water softener can be disinfected by adding a 1/4 to 1/2 cup of bleach into the fill tube of the salt brine tank and activating a manual recharge. You may want to check with your treatment equipment dealer for their advice in this regard.



6. Allow the chlorine solution to remain in the well and water system for at least 24 hours. Then completely purge the solution out of the well and plumbing system until you can no longer smell chlorine. Drain the chlorine solution out of the water heater, refill it with fresh water and reduce the temperature setting back down to a safe setting of 110 to 120 degrees. Since the chlorine solution can disrupt a septic system, do not run the solution into it. Instead, using the hose, discharge the solution to a location outdoors, away from grass and shrubs. **Also make sure the solution does not run into a lake or stream because it will kill fish and other aquatic life**.

7. Properly reinstall your well cap. If it is a vermin-proof cap, make sure it is installed onto the casing in a water-tight manner (except for the well vent). If you have an older overlapping well cap, it is a good idea to install a new department-approved vermin proof cap. Doing so will prevent insects, spiders and bacteria from entering your well head and contaminating your drinking water.

8. You may need to repeat this disinfection process. If indications of iron bacteria persist after repeating this process, a more aggressive cleaning and disinfection procedure should be considered. See the section below describing methods for treating more severe iron bacteria infestations.

Chlorination in arsenic contamination areas

If you live in an area where arsenic is a problem (like northeastern Wisconsin), be aware that disinfection with chlorine can cause chemical reactions that may release arsenic from the bedrock into the well water. The DNR has a brochure describing *"Well Chlorination in Arsenic Sensitive Areas"* (PUB DG-004 2003). This guidance provides alternate chlorination procedures that will minimize the release of arsenic into your well water.

Treating severe iron bacteria infestations

A standard chlorination can effectively take care of minor bacterial problems, but is only modestly successful for thick iron bacteria biofilms. Slimes coating the inner surfaces of a well prevent the chlorine from getting to the bacteria imbedded in the slime. Even if the chlorine solution kills all of the bacteria in the well, bacteria can survive in the surrounding geologic formation. These bacteria can be drawn back into the well during subsequent pumping cycles. Dissolved iron in the water can also use up much of the chlorine, reducing its effectiveness.

In months or years following treatment, iron bacteria tend to build up, often in layers of slime. In many cases it is only possible to control severe bacterial infestations rather than completely eradicate them. For these cases, a

more aggressive approach involving chemical and mechanical treatment followed by a thorough flushing and shock chlorination is usually necessary.

Only an experienced Licensed Well Driller or Pump Installer should undertake this more aggressive approach of cleaning and disinfecting your well. This is because these processes require special equipment, materials and know-how to prevent them from becoming dangerous.

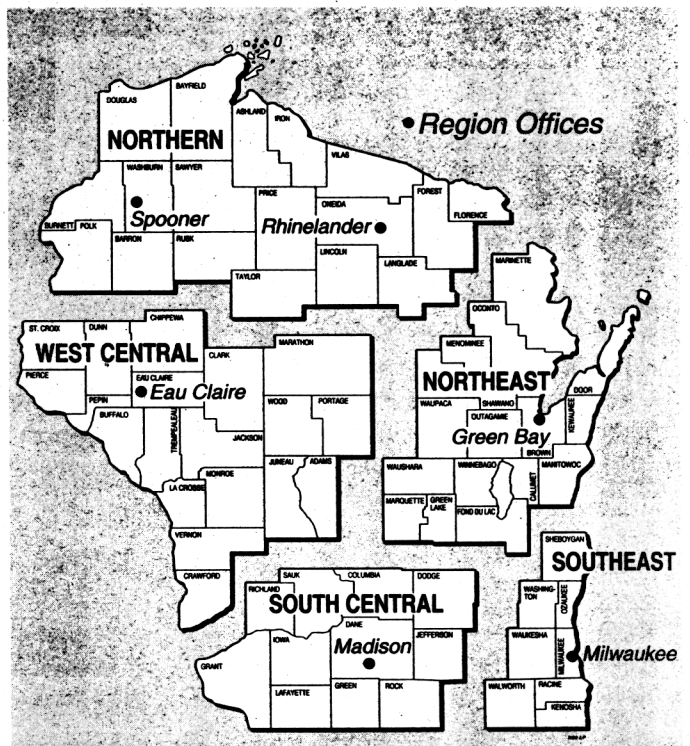
Whatever process is used, the well should be subsequently flushed in a manner that raises bacterial debris up and out the well but does not force it out into the surrounding geologic formation. (Do not be alarmed if, during the flushing process, thick masses of rust-colored slime come gushing out the well. This means the process is working.)

After the well is treated, cleaned and flushed, it should be shock chlorinated, using a more concentrated chlorine solution along with pH control and the addition of salt. Using this more aggressive approach of treatment, cleaning and disinfection is the best way to prevent these biofilm problems from recurring.

You can also help prevent recurrence of biofilm problems by installing a pellet-chlorination treatment unit on your well. These units are designed to periodically inject a solid chlorine pellet down into the well. This helps prevent bacteria from regaining a foothold. Prior DNR approval is required for these units. Contact your regional DNR office for additional information on these units and the approval process. If you install a pellet chlorinator you may want to include a carbon filter on the water service line to remove any residual chlorine from the water you use. The carbon unit must be approved for this purpose by the Department of Commerce Plumbing Bureau.

Additional information

For more information visit the DNR web site at dnr.state.wi.us/environmentprotect/water.html. Choose "Drinking Water & Groundwater" from the drop-down menu, and select from a variety of listed topics. If you have questions regarding iron bacteria or need guidance to properly chlorinate your well, contact a Licensed Well Driller or Pump Installer listed in your local yellow business directory, under "Water Well Drilling & Service" or "Pumps - Service & Repair."



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