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## Iron and Sulfur Bacteria in Water Supplies

Bacterial contamination of a water supply doesn't always mean "health hazard." Some types of bacterial contamination are more annoying than harmful. Iron and sulfur bacteria are two of the most common bacterial contaminants that well owners face. Neither type of bacteria is particularly harmful, at least not at the levels usually seen in well systems. However, they can be incredible nuisances. Here are some valuable tips on how to avoid or treat iron and sulfur bacteria infestations.

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### Iron Bacteria

Iron bacteria is generally more common than sulfur bacteria, simply because iron is abundant in ground water.

Iron bacteria are "oxidizing agents." That is, they combine iron or manganese dissolved in ground water with oxygen. A side effect of the process is a foul smelling brown slime which can coat well screens, pipes, and plumbing fixtures. This slime isn't a health hazard, but it can cause unpleasant odors, corrode plumbing equipment, and clog well screens and pipes. If conditions are right, the bacteria can grow at amazing rates and an entire well system may be rendered virtually useless in just a few months.

There are several signs that may indicate an iron bacteria problem. Water may have a yellow, red or orange color. Rusty slime deposits may form in toilet tanks. A strange smell resembling fuel oil, cucumbers, or sewage may be noticeable. Sometimes the odor will only be apparent in the morning or after other extended periods of non-use.

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### Sulfur Bacteria

There are two categories of sulfur bacteria: sulfur oxidizers and sulfur reducers.

#### Sulfur-oxidizing bacteria

Sulfur-oxidizing bacteria produce effects similar to those of iron bacteria. They convert sulfide into sulfate, producing a dark slime that can clog plumbing.

#### Sulfur-reducing bacteria

Sulfur-reducing bacteria (SRBs) live in oxygen-deficient environments. They break down sulfur compounds, producing hydrogen sulfide gas in the process. Hydrogen sulfide gas is foul-smelling and highly corrosive.

Of the two types, sulfur-reducing bacteria are the more common. The most obvious sign of a sulfur bacteria problem is the distinctive "rotten egg" odor of hydrogen sulfide gas. As with odors caused by iron bacteria, the sulfur smell may only be noticeable when the water hasn't been run for several hours.

In some cases, the odor will only be present when hot water is run; this could indicate that SRBs are building up in the water heater. Blackening of water or dark slime coating the inside of toilet tank may also indicate a sulfur bacteria problem.

Iron bacteria and sulfur bacteria contaminations are often difficult to tell apart because the symptoms are so similar. To complicate matters, SRBs often live in complex symbiotic relationships with iron bacteria,

so both types may be present. Fortunately, both types of bacteria can be treated using the same methods.

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### **Treatment of Iron and Sulfur Bacteria**

There are several different ways of treating iron and sulfur bacteria problems. Some of them are described in the following section, however, the most effective method to use varies from case to case. Environmental Health Services or a licensed well contractor can advise you which method is best for your situation. Consult with them before attempting to treat an iron or sulfur bacteria problem.

### **Prevention**

The best treatment for both iron and sulfur bacteria is prevention.

Unsanitary well drilling can often introduce bacteria into a previously clean water supply. Therefore, anything that will be going into the ground during the drilling process needs to be disinfected. Tools, pump, pipe, gravel pack material, and even water used during drilling should be treated with a 200 milligrams per liter chlorine solution.

Once the well is completed, it should be shock chlorinated (refer to Water Well Disinfection brochure). Well owners should keep a close eye out for any signs of iron or sulfur bacteria contamination.

### **Shock Chlorination**

Chlorine is a common disinfectant used in water systems, and is highly toxic to coliform and similar types of bacteria. Iron and sulfur bacteria are more resistant to chlorine's effects. This is because iron and sulfur bacteria occur in thick layers and are protected by the slime they secrete. A standard chlorine treatment may kill off bacterial cells in the surface layer but leave the rest untouched. In the case of iron bacteria, iron dissolved in the water may absorb disinfectant before it reaches the bacteria.

For all of these reasons, iron and sulfur bacteria may be able to survive a chlorine treatment that would kill other types of bacteria. Contact the Office of Drinking Water and Environmental Health for information on shock chlorinating iron- or sulfur-bacteria contaminated wells.

### **Acid Treatment**

For severe cases, treatment with a strong acid and salt solution following a thorough shock chlorination may be required. The acid solution (commercial hydrochloric acid, commonly known as "muriatic acid") may be able to penetrate thick incrustations of bacteria that the chlorine solution was unable to kill. *This procedure should only be performed by a licensed well contractor.*

### **Water Heater Treatment**

As noted earlier, sulfur-reducing bacteria (SRBs) can often contaminate water heaters, creating a foul smell when hot water is turned on. A water heater provides a good environment for SRBs because it contains a "sacrificial anode." This anode is a magnesium rod that helps protect the water heater by corroding instead of the tank lining. SRBs are nourished by electrons released from the anode as it corrodes.

Water heaters infested with SRBs can be treated. SRBs die at temperatures of 140 degrees Fahrenheit or above, which is roughly equivalent to the medium setting on most home water heaters. Setting the water heater on "high" will raise the water temperature to approximately 160 degrees Fahrenheit and kill any SRBs in the tank. *(This should only be done if the water tank has a pressure relief valve, and everyone in the house should be warned to prevent scaldings.)* After about eight hours, the tank can be drained and the temperature setting returned to normal.

Raising the water heater temperature will temporarily solve the odor problem, but SRBs will quickly reinvade unless more permanent measures are taken.

Removing the sacrificial anode will eliminate the problem, but it can also shorten the water heater lifespan significantly and may void the warranty. Replacing the magnesium rod with one made of zinc won't totally eliminate SRBs, but it will greatly reduce their numbers. Consult with a plumber before attempting to modify your water heater.

**Follow-up Procedures**

Shock chlorination or the other methods discussed should solve the immediate problems associated with iron or sulfur bacteria (odor, slime, etc.), but they are probably not long-term solutions. Iron and sulfur bacteria tend to build up again a few months after treatment. Bacteria problems are much easier to control after the initial contamination has been treated, however.

To keep down bacterial regrowth, well owners can periodically disinfect their wells by shock chlorinating with a weaker chlorine solution. Alternatively, a chlorination unit which will constantly chlorinate the water can be installed. The Office of Drinking Water and Environmental Health or a licensed well contractor can advise you on which option is best for you.

For more information on iron and sulfur bacteria or other water quality issues, please contact the:

Nebraska Department of Health and Human Services  
Division of Public Health  
Office of Drinking Water and Environmental Health  
301 Centennial Mall South  
P.O. Box 95026  
Lincoln, NE 69509-5026  
(402) 471-2541