

Raising the water heater temperature will temporarily solve the odor problem, but sulfur-reducing bacteria 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's lifespan significantly and may void the warranty. Replacing the magnesium rod with one made of zinc won't totally eliminate sulfur-reducing bacteria, but it will greatly reduce the number of bacteria. Consult with a plumber before attempting to modify your water heater.

Point-of-Use Treatment (Carbon Filters)

Some point-of-entry (POE) and point-of-use (POU) systems can inhibit reproduction of bacteria and reduce associated odors and tastes. To determine the best system, you can use the NSF International online product database of drinking water treatment units. Visit the NSF International website at www.nsf.org or call 1-800-673-6275.

Follow-up Procedures

Shock chlorination or the other methods discussed should solve the immediate problems associated with iron or sulfur bacteria, but they may not be 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, or by installing a chlorination unit that will constantly chlorinate the water. A licensed well contractor can advise you on which option is best for you.

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COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

LABORATORY SERVICES DIVISION

Iron and Sulfur Bacteria in Water Supplies

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Bacterial contamination of a water supply doesn't always indicate the existence of a health hazard. Some types of bacterial contamination are more annoying than harmful. The normal bacteria test performed on drinking water is specific for coliform and E. coli. A sample may test negative for coliform but still contain other nuisance bacteria. Two of the most common bacterial contaminants are iron and sulfur bacteria. They are not particularly harmful, but they can be incredibly annoying.

Iron Bacteria

Iron bacteria are generally more common than sulfur bacteria because iron is abundant in ground water. Iron bacteria are oxidizing agents and combine iron or manganese dissolved in ground water with oxygen. A side effect of the process is a foul-smelling brown slime that can cause unpleasant odors, corrode plumbing equipment and fixtures, and clog well screens and pipes. If conditions are right, the bacteria can grow at amazing rates, rendering an entire well system useless in just a few months.

Signs that may indicate an iron bacteria problem include yellow-, red- or orange-colored water; rusty slime deposits in toilet tanks; and strange smells resembling fuel oil, cucumbers, or sewage. Sometimes the odor will only be apparent in the morning or after other extended periods of non-use.

Sulfur Bacteria

There are two categories of sulfur bacteria; sulfur oxidizers and sulfur reducers. Sulfur-reducing bacteria are the more common. 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 live in oxygen-deficient environments. They break down sulfur compounds, producing hydrogen sulfide gas in the process. The distinctive "rotten egg" odor of hydrogen sulfide gas is the most obvious sign of a sulfur bacteria problem. Hydrogen sulfide gas is foul smelling and highly corrosive. As with odors caused by iron bacteria,

the sulfur smell may only be noticeable when the water hasn't been run for several hours.

If the odor is only present when hot water is run, sulfur-reducing bacteria could be building up in the water heater. Blackening of water or dark slime coating the inside of the 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, sulfur-reducing bacteria 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.

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, pumps, pipes, gravel pack material, and even water used during drilling should be treated with a 200-milligrams-per-liter chlorine solution. When the well is completed, it should be shock chlorinated. Well owners should be alert for any signs of iron or sulfur bacteria contamination.

Shock Chlorination

Shock chlorination involves adding chlorine to water to disinfect the water or to obtain other biological or chemical results. 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 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. For information on shock chlorinating iron- or sulfur-bacteria contaminated wells, contact the Laboratory Services Division at 303-692-3048 and request the "Shock Chlorination of Wells and Water Systems" fact sheet.

Acid Treatment

For severe cases, treatment with a strong acid and salt solution following 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 can often contaminate water heaters, creating a foul smell when hot water is turned on. A water heater provides a good environment for sulfur-reducing bacteria 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. Electrons released from the anode as it corrodes nourish sulfur-reducing bacteria.

Water heaters infested with sulfur-reducing bacteria can be treated. Sulfur-reducing bacteria 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 sulfur-reducing bacteria in the tank. (Do this only if the water tank has a pressure relief valve and everyone in the house is warned, to prevent scalding.) After about eight hours, the tank can be drained and the temperature setting returned to normal.