EGLE

FACT SHEET

DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION – ENVIRONMENTAL ASSISTANCE CENTER 800-662-9278

IRON BACTERIA IN WELLS

What are iron bacteria?
Iron bacteria are microorganisms that use iron as an energy source or for other life functions. Because iron is common in Michigan groundwater, it is not unusual to find iron bacteria in well water. Iron bacteria are not hazardous to health, but in some cases they cause troublesome well problems.

Microorganisms from the genera *Gallionella, Leptothrix* and *Crenothrix* are within the iron bacteria group. They are commonly found in surface water and soil. If surface water or soil enters a well, the bacteria may be introduced and begin to thrive if conditions are favorable.

A major problem associated with iron bacteria and other naturally-occurring groundwater bacteria is slime or biofilm production. A reddish-brown slime is a metabolic by-product from the oxidation of iron and manganese by iron bacteria. Biofilm deposition can clog pump intakes, well screens, filters, and water pipes. Biofouling can occur in the aquifer near the well and can build up quickly in comparison to mineral incrustation.

Water utility managers and water well drilling contractors worldwide consider iron bacteria to be a significant problem because of the effects on water system operation. Considerable research on biofilms and well biofouling has occurred in the past decade.

What are the effects of iron bacteria?
The dramatic effects of iron bacteria can be seen in surface waters – brown slimy masses on stream bottoms and lakeshores and an oily sheen upon the water. Iron bacteria infestations in water wells can cause:

- ✓ Unpleasant taste and/or odors resembling fuel oil, sewage, or rotten vegetation.
- ✓ Reduced well yields due to biofilm clogging.
- ✓ Rusty slime buildup in toilet tank, on filters, or the inside of the well casing.
- ✓ Premature corrosion of well components.
- ✓ Difficulty in eliminating coliform bacteria because the biofilm protects the bacteria from the chorine disinfectant.
- ✓ Costly and difficult well rehabilitation.

How are iron bacteria detected?
A special water analysis is needed to confirm the presence of iron bacteria. A standard water test for detecting coliform bacteria is not sufficient for iron bacteria confirmation.

The Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water Laboratory, analyzes for iron bacteria and some private laboratories may perform the testing. Iron bacteria analysis at the EGLE Laboratory is nonroutine and special instructions are needed before submitting a sample. For further information, contact the Drinking Water Laboratory in Lansing at 517-335-8184.

Minimizing iron bacteria problems
Because iron bacteria occur in groundwater, a well drilling contractor may be unable to prevent their entrance into the well. Researchers believe that constructing a well changes the subsurface environment in a manner that increases the activity of natural groundwater bacteria. Well pumping characteristics, aquifer properties, and water quality are among the factors that influence the potential for biofouling problems.

Some field practices can minimize the introduction of bacteria into a new or serviced well. Cleaning drilling tools in between jobs and maintaining a chlorine residual in water used for drilling purposes is strongly advised.

Never use surface water for drilling purposes. If a well with a severe biofouling problem is serviced, drilling rods and other tools should be steam-cleaned or pressure-washed and disinfected afterward. Disinfecting pumps, pipe, screen filter-pack material, and keeping pumps and drop pipe strings off the ground helps keep the installation sanitary. When the well is completed, it should be purged, shock chlorinated, and then pumped.

Well owners should be alert for signs of iron bacteria. Periodic shock chlorination can minimize reoccurrence. Occasional monitoring of bacterial concentrations using iron bacteria screening tests and checking the wells specific capacity can help gauge the potential for serious well plugging problems to develop.

Treating iron bacteria problems

Although there are both chemical and mechanical methods for treating iron bacteria problems, private water well owners should expect to use the former until further study shows the effectiveness of heat or other means to disinfect smaller wells. Since bacteria tend to build up again a few months after treatment, well owners should try to control rather than completely “cure" the problem.

For several reasons, chemical disinfectants that effectively wipe out other bacteria are only modestly successful against iron bacteria. Iron bacteria build up in thick layers, each forming a slime around bacterial cells that keeps disinfectants from penetrating beyond the surface cells. In addition, mineral iron dissolved in water can absorb much of the disinfectants before they reach the bacterial cells. Chemical reactions occur far slower at the cool temperatures common in wells, and bacterial cells need a long exposure to the chemical for treatment to be effective. Even if chlorine kills all the bacterial cells in the water, those in the groundwater can be drawn in by pumping or drift back into the well.

In addition to chemical treatment, other methods are available to control iron bacteria in community water systems. Stagnant water conditions can be avoided by looping dead-end plumbing lines and periodically flushing low-flow lines to reduce bacteria. Forcing hot water or steam into a well to disperse the slime and kill the bacteria has also worked well. In addition, flushing large quantities of heated water into the aquifer has been found successful in field tests.

For information or assistance on this publication, please contact the Drinking Water and Environmental Health Division, through EGLE’s Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.