Public Health
Prevent. Promote. Protect.

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The mission of the Boone County Health Department is to serve our community by preventing the spread of disease, promoting equitable wellness & protecting the public's health.

Drinking Water

Coliform Bacteria

Nitrate

Iron

Hardness

Sulfate

Fluoride

Chloride

pH

Conductivity

Lead

Water Odors

COLIFORM BACTERIA

Coliform bacteria is the standard used for bacterial quality in drinking water. Coliform bacteria is not a single bacteria species, rather it is a grouping of different bacterial species that all exhibit certain characteristics. They are naturally found in the following areas:

1) Coliform bacteria naturally live in the intestinal tracts of humans and animals, and are always found in sewage.
2) Some types of coliform bacteria also naturally live in soils and surface waters (lakes, rivers, ponds, etc.)

The presence of coliform bacteria in well water indicates that sewage or some type of surface water is entering and contaminating the water supply. Along with coliform bacteria, other disease causing organisms may be present, and these can cause diseases such as dysentery, typhoid, and hepatitis. A well contaminated with coliform bacteria requires immediate attention. Most wells can be disinfected by a simple chlorination process. In serious cases, repeated chlorinations may be needed. The Illinois Department of Public Health requires a coliform free water supply. The procedure for chlorinating a well can be obtained from the Boone County Health Department, or a licensed well driller may be contacted to disinfect a well.

NITRATE

Nitrates are compounds containing nitrogen and oxygen. They are a major component in commercial fertilizers but can also occur naturally in ground water. The standard for nitrates in Illinois is 10mg/L (milligrams per liter), set by the Illinois Environmental Protection Agency.

Sources of Nitrates:

- Runoff from fertilizers
- Municipal and industrial waste water
- Septic tanks
- Animal feed lots
- Decaying plant debris
- Refuse dumps

High nitrate levels pose a health risk to pregnant women and infants under the age of six months with a disease known as methemoglobinemia, or “blue baby” syndrome. This illness

occurs as a result of bacteria in an infant's stomach reducing *nitrates* to *nitrites*. Nitrite then combines with hemoglobin in the blood, reducing the blood's capability of carrying oxygen. As a result, the baby will turn blue. Prompt medical attention is required.

Older children and adults can consume large quantities of nitrates without these effects. In the adult stomach, strong acids are produced which inhibit the growth of the bacteria responsible for the conversion of nitrate to nitrite.

IRON

Iron is an abundant element in the earth's crust. Objectionable color, taste, and odor may be present when high concentrations of iron are present. Stained laundry, clogged pipes, and corroded plumbing can also be a result. The Illinois Environmental Protection Agency recommends an iron level of 0.3 milligrams per liter (mg/L).

Iron problems are the result of a high mineral iron content in the water; however, iron bacteria are also responsible for iron related problems.

IRON BACTERIA: Iron bacteria are a group of microorganisms that exist in environments with high levels of iron. Though they pose no health risk, these microorganisms combine mineral iron with oxygen to produce rusty slime that is responsible for objectionable water quality. An iron bacteria contamination can easily be detected by:

- Yellow or orange color to water
- Slime on inner walls of toilet tanks
- Odors that resemble fuel oil, cucumbers, or raw sewage

Once a well becomes contaminated with iron bacteria, it is often difficult to get rid of completely. Chlorinating a well can help to reduce, and in some cases, eliminate iron bacteria. However, it may require repeated chlorinations. The procedure for chlorinating a well can be obtained from the Boone County Health Department, or a licensed well driller can be contacted to disinfect a well. NOTE: In severe cases, shock chlorination may be necessary and should be performed by a licensed well driller.

IRON REMOVAL: Options are available to remove iron from a water supply, if necessary.

PHOSPHATE FEEDERS: (for iron levels up to 2.0 mg/L). This appliance does not actually remove iron, but instead treats the iron so that it stays dissolved in solution rather than precipitating out. A phosphate feeder uses food grade phosphates, and a one pound supply can treat up to 60,000 gallons of water.

ZEOLITE SOFTENERS: (for iron levels up to 10.0 mg/L). This system involves ion exchange and is commonly used to soften water.

MANGANESE TREATED GREEN SAND FEEDERS: (for iron levels up to 10.0 mg/L). This method for iron removal causes dissolved iron to precipitate out. The precipitate is then trapped by the sand filter and is removed when back flushed. This system must be recharged regularly.

HARDNESS

Acceptable levels for water hardness are based upon consumer acceptance.

Hardness is the quantity of calcium and magnesium in the water and contributes significantly to the total dissolved solids. High concentrations are detrimental to boilers and hot water heaters, resulting in scale formations when the water is heated. The amount of soap or detergent required for laundry increases as the hardness of the water increases.

The concept of hardness is difficult to define exactly. In areas of the country where the total dissolved solids are very low, a water hardness of 50 milligrams per liter (mg/L) might be considered "hard". In other areas, a hardness of 50mg/L would be considered "very soft". An attempt was made by Dufor & Becker (1964) to classify the hardness of public water supplies for the 100 largest cities of the United States, (U.S. Geological Survey, Paper 1812, Pg. 27). Their classification is as follows:

Hardness Ranges	
(mg/L as CaCO3)	Description
0 to 60	Soft
61 to 120	Moderately soft
121 to 180	Hard
>180	Moderately hard

It is not unusual to reach 200 to 300 mg/L of hardness where the water is in contact with limestone or gypsum. Water from gypsiferous formations may reach 1000 mg/L or higher.

Note that when the hardness is tested, the result is typically shown in mg/L. The mg/L is the same measurement as ppm (parts per million). If "grains per gallon" is needed as a result, take the mg/L (ppm) divided by 17.1 and the result will be grains per gallon. (1 grain per gallon is equal to 17.1 ppm)

SULFATE

Sulfates are naturally found in many wells in varying concentrations. They are the result of the dissolution of sediment (magnesium sulfate, sodium sulfate, and calcium sulfate). Sulfate is also the result of decaying organic matter. The presence of sulfate in drinking water can result in a laxative effect. Both sodium sulfate (Glauber salt) and magnesium sulfate (Epsom salt) are well known laxatives. The amount of magnesium and sodium in the water significantly influences the laxative effect of the sulfate.

Persons living in an area of high sulfate usually acclimate to water with high sulfates in a relatively short period of time. Newcomers and casual users of the water frequently experience the laxative effect.

The taste threshold for sulfates occurs at levels of 300-400 mg/L, and may cause objectionable taste in water and coffee.

No adverse health effects have been noted from concentrations of 500 mg/L, but it is recommended that sulfates in water not exceed 250 mg/L, to prevent the water from having a laxative effect.

FLOURIDE

Fluorides are an essential constituent of all diets and an important component in maintaining good dental health.

Fluoride, at an optimum level, helps to reduce dental cavities or tooth decay. The most common source of fluoride is drinking water. Fluoride is found naturally in groundwater, but

many communities also supplement their drinking water with fluoride, maintaining levels from 0.9 - 1.2 mg/L.

For those who have private wells, optimum levels may not be found. Low levels of fluoride in drinking water may be a factor in tooth decay. High levels of fluoride can also occur. Excessive fluoride in water can lead to dental fluorosis, a discoloration and mottling of the teeth.

The maximum allowable concentration set by the Illinois Environmental Protection Agency is 2.0 mg/L.

Fluoride testing is not currently offered through the Boone County Health Department. However, for homes with children, the water supply may be tested free through an Illinois Department of Public Health program. Call them at 217-785-4899 to confirm eligibility and make testing arrangements.

CHLORIDE

Chloride is a component in many salts such as sodium chloride (table salt) and potassium chloride. Chlorides, in reasonable amounts, are not harmful to health. When levels become excessive, a salty taste is detected. Although individuals vary in the levels which they find disagreeable, it is generally agreed that levels above 250 mg/L will cause objectionable taste to many people. Excessive amounts of chloride may result in individual consumer complaints.

pH

The measure of the hydrogen ion concentration in water is called pH. The pH measures the intensity of the acidic, neutral, or basic character of a solution. The pH values are measured on a scale of 1 to 14, 1 being acidic, 7 being neutral, and 14 being basic. The pH of most natural water falls within a range of 4 to 9, with the majority being slightly basic. There is no health standard for pH.

Water with a low pH can be acidic, naturally soft and corrosive. Acidic water can leach metals from pipes and fixtures, such as copper, lead and zinc. It can also damage metal pipes and cause aesthetic problems, such as metallic or sour taste, laundry staining or blue-green stains in sinks

and drains. Water with a low pH may contain metals in addition to the before-mentioned copper, lead and zinc.

Water with a high pH level indicates that a high level of alkaline minerals is present. High alkalinity does not pose a health risk, but can cause aesthetic problems, such as an alkali taste to the water that makes coffee taste bitter, scale build up in plumbing, and lowered efficiency of electric water heaters.

CONDUCTIVITY

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity.

Conductivity in stream and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have a lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water.

Since the value or measure of conductivity is directly related to the presence and concentrations of ions in the solution, it is used as an assessment of the effects of chemical stability, physiological effects on plants and animals, and corrosion rates.

LEAD

Lead is naturally occurring bluish-gray metal found in small amounts on the earth's outer layer. Although lead can be found in all parts of our environment, much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead rarely occurs naturally in water; it usually gets into the water from the delivery system. Lead pipes are the main contributor to high lead levels in tap water. Other sources include parts of the water delivery system such as lead solder used to join copper pipes, brass in faucets, coolers, and valves. Current state and federal guidelines for public water supplies call for a maximum amount of lead in drinking water of 15 parts per billion.

If you want to know if your home's drinking water contains unsafe levels of lead, have your water tested. Testing is the only way to confirm if lead is present or absent. For more information on testing your drinking water for lead, call the U.S. Environmental Protection Agency's Safe Drinking Water Hotline at 800-426-4791 or call the Boone County Health Department at 815-544-2951.

If lead is present in your water:

- First try to identify and remove the lead source. If you have a private well, check both the well and the pump for potential lead sources. A licensed water well contractor can help you determine if any of the well components are a source of lead.

- Heating or boiling your water will not remove lead. Because some of the water evaporates during the boiling process, the lead concentration of the water can actually increase slightly as the water is boiled.

- If it is not possible or cost-effective to remove the lead source, flushing the water system before using the water for drinking or cooking may be an option. Any time a particular faucet has not been used for several hours, you can flush the system by running the water for about 1-2 minutes or until the water becomes as cold as it will get. Flush each faucet individually before using the water for drinking or cooking. Avoid cooking with or drinking hot tap water because hot water dissolves lead more readily than cold water does. Do not use hot tap water to make cereals, drinks or mix baby formula. You may draw cold water after flushing the tap and then heat if needed.

- Also consider water treatment methods such as reverse osmosis, distillation, and carbon filters specially designed to remove lead. Typically these methods are used to treat water at only one faucet.

For more detailed information on lead in drinking water, please see the website for the U.S. Environmental Protection Agency at http://water.epa.gov/drink/info/lead/

WATER ODORS

A common water quality complaint of many well owners is a "rotten egg" smell. This odor is most likely hydrogen sulfide, a gas produced from sulfur bacteria. Usually the amount of gas produced is not enough to be considered a health hazard, but is enough to cause unpleasant odors and sometimes plumbing problems.

Hydrogen sulfide in high levels is a corrosive gas which can, over time, eat at metal piping, plumbing connections, and even metal well casings.

The bacteria responsible for these common problems is not unusual. They live off sulfur-containing compounds which are abundant in our soil environment. There are two different types of sulfur bacteria - sulfur oxidizing and sulfate reducing bacteria.

SULFUR OXIDIZING BACTERIA (SOB): These type of bacteria exists in environments where oxygen is abundant. They are responsible for the conversion of sulfides into elemental sulfur. It forms a slime which coats pipes and screens, and can clog a plumbing system.

SULFATE REDUCING BACTERIA (SRB): This type of bacteria, unlike SOB's live in environments with little or no oxygen. They are responsible for the production of hydrogen sulfide gas, along with other by-products.

DETECTING SULFUR BACTERIA: Once you have noticed the rotten egg odor, and before you pinpoint your problem to a sulfur bacteria contamination, it is important to find where the odor is prevalent; in the hot water only, or in both the hot and cold water.

Hot Water Only: If the odor is found in the hot water only, it may be either of two things, the sacrificial element in the water heater or an SRB build-up in the water heater.

1) The sacrificial element – Contact a plumber for specific remedial action.
2) An SRB build-up in your water heater can be simply eliminated by turning the temperature up on your water heater to the high setting (160 degrees F) for eight hours, then draining the tank. The SRB's, at this point, should be destroyed.

CAUTION: The hot water tank must have an operable pressure release valve; otherwise, this method of treatment may be highly dangerous. The temperature setting must be reduced following treatment to prevent scalding, hot water dangers, and to avoid high energy costs.

Hot & Cold Water: If the odor is found in both hot and cold water, then it is safe to assume there is an SRB contamination. This problem can be treated through shock chlorination. If the problem reoccurs, it may be necessary to periodically clean the well by shock chlorination or, in severe cases, install a constant chlorinator.

NOTE: Chlorine must be handled with extreme care. If you are unfamiliar with proper handling procedures – contact a licensed well driller. Use EXTREME CAUTION when working with chlorine or chlorine compounds in an enclosed area.

There are also water treatment devices designed to reduce or eliminate sulfur bacteria odors.

This brochure is intended to describe commonly tested parameters for groundwater quality and safety. Less frequently tested parameters for safety would include metals, solvents, gasoline, pesticides and herbicides. The tests described in this brochure would not indicate the presence of these man-made contaminants.