National Testing Laboratories, Ltd.
Quality Water Analysis

Which Bacteria Do We Test For?

There are many species of bacteria that could potentially be present in your well water. We are going to focus on the bacteria that affect water quality more specifically Coliform and non-Coliform bacteria. Coliform bacteria are found in the intestines of animals and man, thus they are found in waste materials. Coliform themselves are not considered pathogenic, but due to their origin they may indicate a presence of disease-causing organisms. Coliform bacteria are used as indicator bacteria, because of their origin as well as they are easy to isolate, they tend to survive longer than disease causing organism and they are present in larger numbers. Most importantly, Coliform react to the natural environment and treatment processes in the same manner as pathogens.

Coliform Bacteria

Coliform can indicate a presence of pathogens that could cause intestinal infections, dysentery, hepatitis, typhoid fever, cholera and other illness. While intestinal infections and dysentery can easily be treated, they may be fatal to infants, the elderly and those with compromised immune systems. Due to the water disinfection methods used in the United States today it is rare to see cases of hepatitis, typhoid or cholera.

E.Coli Bacteria

A subset of Coliform bacteria is fecal bacteria, the most common being E.Coli (Escherichia Coli). Fecal bacteria can be pathogenic or nonpathogenic. E.Coli also originates in the intestines and are actually necessary because they help us digest food and provide us with a source of vitamin K and B-Complex vitamins. Within the species of E.Coli there are many different “strains” or serotypes, which can be harmful to us.

There are over 140 different serotypes of E.Coli and of those, less than 10 percent can cause gastrointestinal problems. Even if one of these serotypes is present, it may take the presence of 100,000 bacteria to cause illness. E.Coli is also used as an indicator because it is present in sewage in high numbers; it is easily cultured and has the ability to grow at elevated temperatures. A presence of E.Coli does not necessarily mean you will get sick, it is an indication there may be sewage contamination and pathogenic organisms may be present. Pathogenic fecal bacteria can cause severe diarrhea, cramps and nausea.

Test for what?

Since it is impractical and expensive to test for all pathogenic organisms in drinking water, it is standard to test for the indicator bacteria organism like coliform and E.coli. Their presence gives an indication of possible presence of more dangerous organisms.

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How are wells contaminated?

Private wells are not regulated; it is the responsibility of the homeowner to ensure the drinking water supply is safe. Recommendations for safe levels are based upon requirements for public water supplies; there should be no presence of Coliform bacteria. The State University of New Jersey recommends testing wells for bacteria at least twice a year, more often in areas with a higher concentration of wells and septic tanks. You may also want to consider more frequent testing if you live near farms with livestock such as pigs, cattle, horses or sheep.

Bacteria contamination in wells and springs is quite common. According to studies done at Ohio State University over 40 percent of private water supplies are contaminated with Coliform bacteria.

There are several conditions that can cause Coliform bacteria to be present in a private well:

- Loose or worn seal on drilled or driven wells
- Defective, too short or inadequately sealed casing in drilled and driven wells
- Defective wall lining or cracked concrete apron of a dug well
- Repair to well structure or submerged pump
- Flooding of the well due to hurricanes, floods, heavy rainfall or other natural disasters
- Breakdown and repair of septic tank system
- Wells drilled into fractured rock formations
- Wells located in areas where ground waters are subject to continuous contamination from outside sources

You should disinfect your well if any of the above conditions exist; after a repair to an existing well or pump; after construction of a new well and before any water is used; and finally upon receipt of a laboratory report showing a presence of Coliform bacteria.

If the water supply is contaminated, you can boil the water to make it safe for drinking, cooking and brushing teeth. Another method for disinfection is chlorination, which involves putting household bleach in the well and flushing the system. After chlorinating the well you need to perform an additional bacteria test to make sure the chlorine has eliminated all the bacteria. A second bacteria sample after chlorination and an inspection of the well construction will determine if the bacteria are a temporary condition or if it originates from the groundwater. If the second bacteria sample is positive you may want to consider a more permanent means of disinfection.

Water Treatment for Bacteria

The most common and widespread health risk associated with drinking water is microbiological contamination. It is important to ensure its safety. There are a couple of ways to permanently disinfect your water supply to ensure it is free of bacteria.

Chlorination

Chlorination is a popular choice for temporarily disinfecting wells; however, it is a good option for a permanent fix. Chlorinators will feed small amounts of chlorine into the water to kill any bacteria that may be present. Chlorinators are commonly used because they also help in correcting other problems for instance chlorine is an excellent oxidizer so it can easily oxidize iron to be filtered out. Additionally chlorine provides residual protection meaning that a small amount of chlorine left in the water will continue to provide protection throughout the water distribution system within the household. The biggest drawback to using chlorine is that it produces by-products, most commonly a group called the trihalomethanes. These trihalomethanes have been linked to cancer, but additional studies are being conducted to determine the real threat. Trihalomethanes can easily be removed using a carbon filter at the drinking water tap, producing drinking water that is free of microbes and trihalomethanes.

Ozone

Ozone is another method used to disinfect water, gaining in popularity for specific applications. Ozone is an excellent disinfectant that is capable of destroying viruses and waterborne parasites that may be resistant to chlorine. Ozone can also help in removing color and odors from the water without leaving a residue. Since ozone is a gas and cannot be prepackaged, it must be generated onsite, and these generators will require regular maintenance. Since ozone is also a powerful oxidizer, it can also oxidize natural elements in the water. Specifically ozone is known to convert bromide into bromate. Bromide occurs naturally in ground and surface water and may be found in the salts used in softeners. When exposed to ozone bromide will convert into bromate, a known carcinogen. The Environmental Protection Agency (EPA) regulates the level of bromate can be no greater than 0.010 mg/L.

Ultraviolet Light

Ultraviolet light has been used as a disinfectant for almost 75 years; however, it has only recently become more widely acceptable and available for residential and commercial applications. It is gaining significant recognition in the scientific arena due to studies indicating its effectiveness, safety and cost efficiency. Ultraviolet radiation is capable of destroying/inactivating all types of bacteria, viruses and cysts, which may be resistance to chlorine. The ultraviolet radiation is generated through a conversion of electrical energy using a mercury vapor lamp. An ultraviolet system consists of one or more ultraviolet lamps enclosed in a quartz sleeve. The water passes through the disinfection chamber where it is exposed to UV radiation, which kill/inactivate bacteria, viruses and cysts adding nothing to the water. Since it adds nothing to the water there is nothing to provide residual protection, meaning the water can be contaminated after the UV system. Also if there are minerals present like calcium, magnesium, iron or manganese this may reduce effectiveness, because particulates can provide hiding places for microorganism and mineral build-up on the quartz sleeve will drastically reduce the effectiveness. Often pretreatment is required to ensure complete protection.

Which is right for you?

There are many systems available depending on your specific situation. The quality of the water will play a big part in deciding which system will most benefit you and your family, so make sure you have all the facts. Talk to water treatment professional and look for those with the proper credentials such as licenses and trade association certification.

Resources:

www.wqa.org Water Quality Association – association of water treatment professionals.

www.ngwa.org National Ground Water Association – association of groundwater professionals including well drillers, geologist and other ground water professionals

www.agwt.org American Ground Water Trust – non-profit organization dedicated to public education on groundwater and it protection

www.wellowner.org Website of the NGWA dedicated to educating well owners about caring and maintaining their wells.

www.epa.gov/safewater The Environmental Protection Agency's website for the Safe Drinking Water Act which are the rules regulating public drinking water systems in the Unites States.

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