

Testing for Water Quality

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Introduction

The question of whether or not to have your water tested is a serious one. It concerns the health of you and your family. Your water should be safe to drink and acceptable for all other household uses. In addition to illness, a variety of less serious problems such as taste, color, odor and staining of clothes or fixtures are symptoms of water quality problems. Even water that appears problem-free may not necessarily be safe or acceptable.



Not everyone needs to test their water and it is impractical and unnecessary to test for all possible contaminants. This publication provides a few guidelines for deciding whether or not to have your water tested, and if so, what tests would be appropriate for your situation. Your Cooperative Extension Service agent can offer you further assistance and information.

Public versus Private Water Supplies

Consumers get their drinking water primarily from two sources: public water supplies and private wells. Public water systems draw water from rivers, reservoirs, springs or groundwater wells and have at least 15 year-round connections or serve more than 25 people. Most private drinking water comes from wells, although springs and ponds are sometimes used.

If your water comes from a public or municipal water system, it is regularly tested for contaminants regulated by federal and state standards, such as microbial pathogens, radioactive elements and organic/inorganic toxic chemicals. In most cases, water testing for health protection is not necessary for a person serviced by a public or municipal system. However, since water tests are conducted at the source, it is possible to have a problem in the municipal delivery line or in the home plumbing system that could contaminate the water.



If your water supply is a private well, you alone are responsible for assuring that it is safe. So set up routine testing for a few of the most common contaminants. Even if you currently have a safe, pure water supply, regular testing can be valuable because it establishes a record of water quality.

Specific Contaminant Testing

Water tests may be conducted to evaluate basic water chemistry and to determine if the water meets the minimum criteria for bacterial and chemical content. There is no one simple test for all water problems.

Bacteriological Test A bacteriological test tells you if your water is free from disease-causing bacteria. It is possible to test for virtually every water-borne disease-causing bacteria and virus, but such a test would be costly. Instead, the most common test is for total coliform bacteria. Because coliform bacteria commonly inhabits the gastrointestinal tract of warm-blooded animals, they serve as indicators of fecal contamination and as a marker for other, possibly pathogenic microorganisms.

The report from the laboratory will indicate that the water is either coliform negative or coliform positive. If the test is coliform positive, then you should act immediately to determine and eliminate the source of contamination and/or disinfect the water before use.

Mineral Test A mineral analysis indicates the extent of mineral impurities in the water. Large amounts of minerals and other impurities may pose a health hazard and affect the appearance and usefulness of the water.

A typical mineral analysis will give the content in parts per million of mineral elements such as calcium, magnesium, manganese, iron, copper and zinc. It will also determine the acidity or pH of the water and the hardness, expressed in parts per million or grains per gallon. It may also give the concentration of nitrate, sulfates and other chemical compounds.

Chemical Test Many man-made chemicals can contaminate a water supply and impair its usability and/or create a health hazard. Examples include petroleum products, agricultural pesticides and industrial chemicals.

Unless a specific chemical or type of chemical is suspected to be in the water, this type of test is not routinely performed. It can be very expensive to test for the presence of unspecified chemical contaminants. However, if you suspect a particular chemical a test can usually be performed at minimal cost.

When to Test

Whether you have a public or private water supply, have your water tested in any of these situations:

If family members or house guests have recurrent incidents of gastrointestinal illness - test for coliform bacteria, nitrate and sulfate.



If household plumbing contains lead pipes, fittings or solder joints - test for pH, corrosion index, lead, copper, cadmium and zinc.

If you are buying a home and wish to assess the safety and quality of the existing water supply - test for coliform bacteria, nitrate, lead, iron, hardness, pH, sulfate, total dissolved solids (TDS), corrosion index and other parameters, depending on proximity to potential sources of contamination.

If a water softener is needed to treat hard water - test for iron and manganese, which decrease the efficiency of cation exchange softeners, before purchase and installation of this type water treatment system. (Cations are calcium, magnesium and other positively charged metal atoms used to soften water.)

If you wish to monitor the efficiency and performance of home water treatment equipment - test for the specific water problem being treated on installation, at regular intervals after installation and if water quality changes.

If water stains plumbing fixtures and laundry - test for iron, manganese and copper.

If water has an objectionable taste or smell - test for hydrogen sulfide, pH, corrosion index, copper, lead, iron, zinc, sodium, chloride and TDS.

If water appears cloudy, frothy or colored - test for color, turbidity and detergents.

If pipes or plumbing show signs of corrosion - test for corrosion index, pH, lead, iron, manganese, copper and zinc.

If water leaves scaly residue and soap scum and the cleaning action of soaps and detergents is decreased - test for hardness.

If water supply equipment (pump, chlorinators, etc.) wears rapidly - test for pH, corrosion index, sand and silt.

Private Water Supplies

Routine Tests The testing frequencies that follow are general guidelines. Test more often if you suspect that there is a problem with the quality of your drinking water.



Once each year test for coliform bacteria, nitrate, pH and TDS. Test for these contaminants during the spring or summer following a rainy period. Conduct these tests after repairing or replacing an old well or pipe and after installing a new well or pump.

Every three years, test for sulfate, chloride, iron, manganese, lead, hardness and corrosion index.

If a new baby is expected, test for nitrate in the early months of the pregnancy, before bringing an infant home and again during the first six months of the baby's life.

Special Situations What you are living next to can sometimes affect the quality of your well water. If someone in your family becomes ill, or the taste, odor or color of your water changes, your water supply might be contaminated.

If your well is in an area of intensive agricultural use - test for pesticides commonly used in the area, coliform bacteria, nitrate, pH and TDS.

If your well is near a gas-drilling operation - test for chloride, sodium, barium and strontium.

If your water smells like gasoline or fuel oil and your well is located near an operational or abandoned gas station or buried fuel storage tanks - test for fuel components or volatile organic compounds (VOCs).



If your well is near a dump, junkyard, landfill, factory, or dry-cleaning operation - test for volatile organic compounds (fuel components and cleaning solvents), pH, TDS, chloride, sulfate and metals.

If your well is near sea water and you detect a salty taste or notice signs of corrosion on pipes - test for chloride, TDS and sodium.

Where Can You Have Water Tested?

Municipal water supply systems regularly test for primary contaminants, monitor levels of sodium and certain unregulated chemical contaminants and look for corrosion in the water distribution system. They will provide water quality reports upon request.

County health departments will usually conduct a bacteriological test.

The University of Georgia Cooperative Extension Service will conduct certain chemical and mineral tests. Contact your local Cooperative Extension agent for information.

Private testing laboratories are listed in the yellow pages of the telephone book; make sure they are certified by your state health department.

Local engineering firms may test water for certain contaminants.

Water treatment companies and plumbing supply stores may offer certain tests in your home for free. However, have a certified testing laboratory verify the test results before purchasing a water treatment system from the company that conducted the free test.

How to Collect Test Samples

Before collecting water for testing, contact the laboratory or agency which will perform the test. It should provide you with a set of instructions and a bottle in which to collect the sample. Use the containers provided, and carefully follow instructions for collecting, preserving and handling water samples. Instructions may vary depending upon the type of test being conducted. Samples for coliform bacteria testing must be collected using sterile containers and under sterile conditions. Some procedures require letting water run from an inside faucet (aerator removed) for several minutes before filling the sample containers. Other instructions ask you to collect samples in the morning, after water has been confined in the pipes overnight. Sometimes the laboratory will send a trained technician to collect and/or analyze the sample in your home. Ask if this service is available because you may obtain better samples and more reliable test results.

The laboratory will conduct the tests and return a report indicating what, if any, contaminants exceed minimum standards. Many testing laboratories will also recommend the type of water treatment system needed to correct the water quality problem.



Keep a record of all your water test results as a reference for future testing. Even slight changes in contaminant concentrations may be indicators of new water problems you may not detect yourself. By comparing recent test results with original results, you may discover that a change in treatment is needed or that a treatment device is not working as it should.

Understanding the Water Test Results

Laboratory reports may be difficult to understand. Most companies send a cover letter explaining the report in non-technical terms and the actual analysis sheet. Call the testing laboratory if you need help with interpretation. Here are items and terms commonly used in laboratory reports.

MCL is the abbreviation for Maximum Contaminant Level. This is defined as acceptable levels as recommended by the U.S. Environmental Protection Agency.

Detection Level is the level at which the laboratory's equipment and procedures were able to produce results within normal acceptable limits of accuracy.

Level Detected is the amount found in your water and may be reported in parts per million (ppm), milligrams per liter (mg/l), parts per billion (ppb) or other appropriate units.

Hardness is the term applied to water containing calcium or magnesium salts. However, the laboratory report usually lists hardness as equivalent calcium carbonate (CaCO_3). The results will be reported in parts per million or grains per gallon (one grain per gallon is equivalent to 17.1 ppm).



Hard water, when heated, develops hard scale on pipes, cooking utensils and other metal objects. The life and efficiency of heating equipment are decreased by the production of the hard scale on heating coils or elements. Hard water causes soaps to curd in the water rather than make a lather. Minimal problems are usually experienced as long as the hardness value is less than 100 parts per million (5.8 grains per gallon).

Dissolved Gases usually are carbon dioxide (CO_2) and hydrogen sulfide (H_2S). The concentration of these gases usually is not reported. However, objectionable taste and odor and high acidity may indicate their presence.

Carbon dioxide results primarily from decaying organic matter in water-bearing soils. It accelerates corrosion of iron, brass, copper and aluminum, causing rust-colored stains from copper piping. Hydrogen sulfide comes from a sulfur source, usually accompanies iron in water, and releases a rotten-egg odor. Hydrogen sulfide corrodes iron, brass and copper and causes black stains. Metallic taste often results from the corrosion of plumbing.

Acidity - Normally the pH of the water is 6.5 to 8.0. Water with a pH of less than 7 becomes increasingly acidic. Acid water dissolves metal, shortens the life of plumbing, discolors water, clogs pipes and develops stains on fixtures. Water systems of all plastic piping with glass-lined tanks are less affected by acidity than metal plumbing.

Iron - The level of iron in the water analysis report should be less than 0.3 parts per million (milligrams per liter) for a domestic well. Iron from a well usually is dissolved ferrous bicarbonate, which is colorless. However, exposure to air or heating changes this compound to ferric hydroxide, which gives water a red or rusty appearance, stains fixtures and develops a metallic taste in water.

Iron also can be accompanied by iron bacteria. These bacteria multiply in the water and consume iron while producing a rust-colored slime that coats the interior surfaces of the plumbing. Total disinfection with regularly repeated treatment might be necessary to control the bacteria.

Turbidity (cloudy water) levels should be less than 5 units to be considered safe. Take special care to determine the reason for the turbidity, because this can be a symptom of a more serious water contamination problem.



Turbidity can be caused by suspended solids such as mud, algae, iron or other materials. Increases in turbidity after rainfall can indicate surface or other introduced pollution.

Color, Palatability or Odor usually result from some of the already mentioned conditions. Correction of any existing conditions most likely improves color, taste and odor.

Home Water Treatment Systems

Water quality problems can be treated in the home with water filters, distillers, softeners, reverse osmosis units and chemical treatment. Before you purchase a system invest time reading about water quality and health "risk" factors. Understand the difference between harmful "contaminants" and the minerals found in our water supply which pose no health risk. Gain a basic knowledge about the functions and limits of each water treatment system.



Being an educated consumer will help you choose a water treatment system for your specific water quality problem and allow you to speak knowledgeably with sales people and water treatment specialists.

For further information, request a copy of *Water Quality Problems - Health and Household* and *Home Water Treatment Systems* from your Cooperative Extension Service office.

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