# DRINKING WATER QUALITY BACKGROUNDER

## Introduction

All of us have come to expect good water to drink. School drinking water sources are usually regulated by state or local agencies. However, some small or rural school districts are responsible for evaluating and maintaining their own supply systems. Any water systems can become contaminated and impact the health of the students, staff, and community.

Sometimes water contamination occurs naturally, however, serious contamination is usually the result of human activities on the land surface. Some examples include:

**Table 1.**

| Source or Activity | Potential Contamination |
|---|---|
| Agricultural Activities | Nitrate-nitrogen and pesticides |
| Residential Areas with Septic Systems | Nitrate-nitrogen, bacteria, viruses, synthetic organics used in household cleaning products and septic tank cleaners |
| Industrial Activities | Organic chemicals and metals |
| Gasoline Storage (inc. service stations) | Leaks and spills of petroleum products |
| Roadways | Petroleum pollutants leaked from vehicles and metals from exhaust fumes |
| Older Sanitary Landfills | Leachate may contain many chemicals at relatively high concentrations. |

Common water quality problems and their causes are shown in Table 2 (end of backgrounder).

## Water Supplies

In order to ensure an adequate and potable supply of water, schools usually: (a) connect to an approved public water supply system or (b) use a properly designed and regulated school-owned system (if the school meets certain requirements and an adequate public water supply system is not accessible).

A school-owned water supply system should be designed by a professional engineer and offer equivalent sanitary protection as determined by the state or local health authority. Schools using these systems may be required to submit a water sample at least quarterly to a licensed laboratory for microbiological analysis.

Where water under pressure cannot be made available, the drinking water from an approved source should be stored in a clean container having a tight-fitting lid and a suitable faucet apparatus for filling individual cups. Single service drinking cups should be provided. Common drinking cups or containers should be prohibited.

## Should the Water Be Tested?

Water may not necessarily be safe or acceptable, even when chemicals and microbes are present in low concentrations and cannot be detected by sight, taste or smell. The presence of chemicals and microbes requires a water analysis that can

be performed in a laboratory or with reliable field test kits.

***Public and Municipal Supplies*** If your water comes from a public or municipal water system, your water is regularly tested for contaminants as required by federal and state standards. However, some public water supplies may have water quality problems caused by inadequate municipal water treatment facilities or distribution systems and may require periodic testing. Some rural water supply districts do not have enough money to hire trained specialists or to immediately comply with expanding government requirements. In addition, corrosive water or deteriorating pipes in the building may add contaminants to municipal drinking water after it enters the building. Lead contamination in water generally originates in pipes, fittings, and fixtures in or near a building (see Lead Exposure Backgrounder).

***School-Owned or Well Supplies*** For drinking water from wells or school-owned systems, routine testing for a few of the most common contaminants is highly recommended and often required. Even if you currently have a safe, pure water supply, regular testing can be valuable because it establishes a record of water quality. This record can be helpful in solving any future problems and in obtaining compensation if someone damages your water supply.

## Types of Water Tests

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 can determine if your water is free from disease-causing bacteria. Although it is possible to test for virtually every water-borne disease-causing bacteria and virus, such a test would be very costly. Instead, only a test for total coliform bacteria is usually run. 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 take immediate steps 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 use characteristics 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. It is not routine and can be very expensive to test for the presence of unspecified chemical contaminants; however, if a particular chemical is suspected, a test can usually be performed at minimal cost.

## When to Test

Whether you have a public or school-owned water supply, if a problem or symptom described in Table 2 is observed, then it is recommended that the water be tested for the associated contaminant(s). You should also test if:

- Staff or students have recurrent incidents of gastrointestinal illness -- test for coliform bacteria, nitrate and sulfate.
- Plumbing contains water cooler drinking fountains, lead pipes, fittings or solder joints -- test for pH, corrosion index, lead, copper, cadmium and zinc.
- Water supply equipment (pump,

chlorinators, etc) wears rapidly -- test for pH, corrosion index, sand and silt.

***School-Owned Water Supplies***

For school-owned supplies, it is important that certain routine tests be conducted periodically for a few of the most important contaminants. In addition to these routine tests, there are specific water tests that are required because of special situations. Note that these are basic testing suggestions -- it is recommended that a water quality specialist be consulted before performing a series of expensive tests for specific contaminants.

***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 total dissolved solids (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 3 years, test for sulfate, chloride, iron, manganese, lead, hardness and corrosion index.

***Special Situations***

- If day care is provided for infants less than 6 months in age, or when staff members may be pregnant -- test for nitrates more frequently.
- 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.

## Who Performs Water Tests?

- *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.

- *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 for free. However, it is a good practice to have a certified testing laboratory verify the test results before purchasing a water treatment system from the company that conducted the free test.

## Collecting a Water Sample

To assess the year-round safety of your drinking water, you must collect the sample when contaminants are most likely to be present. For example, coliform bacteria and nitrates are most likely to be found during wet weather, while pesticides are more likely to be present just after they are applied.

If samples are to be collected by school staff, contact the laboratory or agency which will perform the analysis. It should provide you with a set of instructions and a sample bottle. Use the containers provided, and carefully follow the instructions, that can vary depending upon the type of test being conducted. Sometimes the laboratory will send a trained technician to collect and/or analyze the sample at the school.

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.

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**ble 2. Common Drinking Water Problems and Causes**

| | SYMPTOM | CAUSE |
|---|---|---|
| | Soap curd & lime scum in bath, white scale in pipes | Excessive magnesium & calcium salts |
| | Feels abrasive when washing. leaves residual in bath | Silt passing through well screen |
| | Grassy or musty | Organic matter |
| | Chlorine | Excessive chlorination |
| | Rotten egg | Hydrogen sulfide, Sulfate bacteria |
| | Chemical (phenol) | Industrial waste seeping into water supply |
| | Salty or brackish | High sodium or magnesium content |
| | Metallic | Low pH, High iron content |
| osion | Blackening or pitting of sinks and dishwashers | Excessive chloride content |
| | Mud, silt & clay | Suspended matter in water supply |
| | Green stains on plumbing fixtures | Low pH reacting with copper & brass piping or fi |
| | Stains dishes and laundry | Dissolved iron |
| | Red sediment when water is left standing | Precipitated iron |
| | Red color even after standing for 24 hours | Colloidal iron |
| | Cloudiness when drawn | Entrained air from faulty pump,<br>Sludge pickup in hot water heater,<br>Methane gas |
| | Yellowish, mottled teeth in children | Excessive fluorides |
| | No color, taste or odor signs. Possible health effects | Industrial pollution, Corrosion products |
| | No color, taste or odor.<br>May be a health hazard for infants | Human or animal waste and fertilizers seeping in<br>water supply |
| des | Chemical taste | Excessive agricultural spray applications |
| | No color, taste or odor signs.<br>May be a health risk | Natural radium radioactivity, Atmospheric fallout,<br>waste, Radon gas |

***urce:*** Condensed from Water Processing for Home, Farm & Business, ***pgs. 61-68, Water Quality sociation, 1988.***