All water contains dissolved substances, and at high concentrations some may be harmful. Having a water sample tested at an approved laboratory helps ensure that drinking water is safe.

Why Test Water Quality?

Concern about water quality often leads consumers to ask questions such as “What is in my water?” or “Is my drinking water safe?”

All water from natural sources contains dissolved substances. These substances are often called contaminants, especially when the amounts present are at possibly harmful or problematic levels. The substances in water can result from either natural processes or human activities. At low concentrations, many do not cause known harmful effects and may be beneficial. Research shows some substances may be harmful only when present at high enough concentrations.

The only way to know if the water you use for drinking and cooking contains potentially harmful substances at levels high enough to be of concern is for the water to be tested. Analytical testing can determine what substances are present and their concentration levels.

Testing Public Water Supplies

A public water supply is defined as a system that provides piped water for human consumption to at least 15 service connections or regularly serves at least 25 individuals. The US Congress enacted a program to ensure that public drinking water is safe. The Safe Drinking Water Act directs the US Environmental Protection Agency (EPA) to establish minimum national drinking water standards for potential contaminants. In Nebraska, the Nebraska Department of Health and Human Services (DHHS) administers the Safe Drinking Water Act.

Public drinking water standards established by EPA fall into different categories—Primary Standards, Action Levels, Secondary Standards, and Health Advisories. The EPA designates these standards to establish a level of protection for human health.

Table 1. Public drinking water standards by EPA.

<table>
<thead>
<tr>
<th>Environmental Protection Agency Designation</th>
<th>Criteria For Designation</th>
<th>Public Water Supply Requirements Associated with Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Standards</td>
<td>Human health protection</td>
<td>Enforced</td>
</tr>
<tr>
<td>Action Levels</td>
<td>Human health protection</td>
<td>Enforced</td>
</tr>
<tr>
<td>Secondary Standards</td>
<td>Aesthetic properties of water</td>
<td>Not enforced (guidelines)</td>
</tr>
<tr>
<td>Health Advisories</td>
<td>Estimate of long-term human health protection</td>
<td>Not enforced (guideline)</td>
</tr>
</tbody>
</table>
Levels, Secondary Standards, and Health Advisories (see Table 1). Primary Standards and Action Levels are based on health considerations and designed to protect human health against three classes of toxic pollutants: pathogens, radioactive elements, and toxic chemicals. Primary Standards and Action Levels are enforced by the EPA. If a contaminant exceeds the maximum level allowed, the water supplier must reduce the level. Water suppliers must notify consumers if a drinking water standard is violated.

Secondary Standards are based on aesthetic factors such as taste, odor, color, corrosivity, foaming, and staining properties that may affect the suitability of a water supply for drinking and other domestic uses. They serve as guidelines for water treatment plant operators attempting to provide the best quality water possible and are not enforceable. Health Advisories are an estimate of acceptable drinking water levels for a chemical substance over a given period of time based on health effects information. These are not enforceable but serve as guidance to water suppliers.

Setting drinking water standards involves uncertainty. Data relating human health effects to chemicals in drinking water are limited, and scientists have difficulty predicting the effects of drinking small amounts of chemicals over a lifetime. In addition, regulatory decisions frequently incorporate economic, political, and social considerations. Therefore, it is important to understand that standards for drinking water contaminants do not guarantee that water with a contaminant level below the standard is risk free. Nor do the regulations mean that water with a contaminant level above the standard is automatically unsafe in all instances. Current drinking water standards reflect scientific judgement and expertise based on all available knowledge.

Current EPA regulations cover about 100 potential contaminants. All public water supplies are required by law to be tested on a scheduled basis for these. There are specific requirements for the frequency of testing for each contaminant. Requirements vary—generally, larger systems and systems serving permanent resident populations are required to document more frequent testing.

The Safe Drinking Water Act requires that public water supply systems provide annual water quality reports, referred to as consumer confidence reports (CCRs). These indicate what regulated contaminants are present in the water, the concentration of the contaminants, and if contaminants exceed the maximum contaminant level allowed. If your water comes from a public system, you can contact the water supplier and ask for a copy of the latest annual CCR. Check your water bill, the yellow pages in your phone book or on the web, or contact a city hall representative or a village board member to determine how to contact your water supplier.

Testing Private Water Supplies

The Safe Drinking Water Act requirements for testing public water supplies do not apply to private drinking water supplies. In addition, Nebraska DHHS does not require testing of private drinking water supplies. Thus, testing a private water supply in Nebraska is not required by federal or state regulations. Regulatory exceptions occur where state licensing may be required for a specific activity. Local regulations may be stricter than those issued by the state. Contact your county and city health, environmental, zoning, or planning departments for information on any existing county or city requirements for private water supply testing where you live.

Testing a private water supply is recommended. Annual tests for coliform or *E. coli* bacteria and nitrate are suggested as general indicators of the safety of private well water.

**There is no single test to determine the safety of drinking water.** As with public drinking water, many contaminants can present a health risk if present in sufficient concentrations. These include biological contaminants such as bacteria or viruses; inorganic chemicals such as lead, nitrate or sulfate; and organic chemicals such as insecticides, herbicides, fuel, and solvents. Other contaminants, while not a health risk, can make water less desirable for domestic use. These are referred to as nuisance contaminants and include calcium, magnesium, iron, manganese, and hydrogen sulfide. It would be costly, and in most cases unnecessary, to test private water supplies for the nearly 100 contaminants for which public water supplies are required to test.

**Users of private drinking water wells must decide which contaminants to test for and must order tests accordingly.** A water testing laboratory only tests for specifically requested contaminant analysis. Reports will indicate if the contaminant is present in the water and at what concentration. Information will not be provided on contaminants for which analysis was not specifically requested.

**Testing for Nitrate and Coliform or E. coli Bacterial Contamination**

Generally, private water supplies should be tested annually for nitrate and bacterial contamination. These tests also should be considered after flooding or when any noticeable change in taste, color or smell is detected. These changes may also indicate the need for other tests. Testing
for bacterial contamination should occur any time users of the water supply experience recurring bouts of intestinal illness or when an infant, person with a compromised immune system or elderly person becomes a water user. In addition, testing for bacterial contamination should occur when repairs or alterations are made to the well or water system, when activating a well or water system that has not been used for an extended period of time, and following shock chlorination. Testing for nitrate should occur any time a pregnant woman, woman anticipating pregnancy, or infant under 6 months old becomes a water user.

Coliform bacteria is most likely to be found during periods of wet weather when the soil is warm. Runoff and excess soil moisture carry contaminants into shallow groundwater

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Source To Test For</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard water, staining, deposits or degradation of household plumbing</strong></td>
<td>Calcium and magnesium (water hardness)</td>
</tr>
<tr>
<td>White scaly deposits in pipes or appliances; soap scum in sinks and bathtubs</td>
<td>Calcium and magnesium (water hardness)</td>
</tr>
<tr>
<td>Green stains on fixtures, blue-green tint to water</td>
<td>Copper</td>
</tr>
<tr>
<td>Reddish-brown stains on sinks, porcelain fixtures, or laundry</td>
<td>Iron</td>
</tr>
<tr>
<td>Brownish-blackish stains on fixtures and laundry; affects the flavor and color of food and water</td>
<td>Manganese</td>
</tr>
<tr>
<td>Reddish-brown slime; brownish-black slime</td>
<td>Iron bacteria, manganese bacteria</td>
</tr>
<tr>
<td><strong>Taste</strong></td>
<td>Total dissolved solids that are alkaline</td>
</tr>
<tr>
<td>Soda taste, slippery feel</td>
<td>Total dissolved solids, chloride, sodium, sulfate</td>
</tr>
<tr>
<td>Salty or brackish water; blackening and pitting of stainless steel sinks and kitchen utensils</td>
<td>Total dissolved solids, chloride, sodium, sulfate</td>
</tr>
<tr>
<td><strong>Odors</strong></td>
<td>Volatile organic chemicals</td>
</tr>
<tr>
<td>†Gasoline or oil smell</td>
<td>Dissolved hydrogen sulfide (difficult to test for), sulfate-reducing bacteria</td>
</tr>
<tr>
<td>Rotten egg odor</td>
<td>Coliform bacteria, iron bacteria, manganese bacteria, sulfur bacteria</td>
</tr>
<tr>
<td>†Septic, musty, or earthy</td>
<td>Coliform bacteria, iron bacteria, manganese bacteria, sulfur bacteria</td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td>Iron</td>
</tr>
<tr>
<td>Water appears clear when first drawn; turns reddish-brown during cooking/ heating, or water is discolored when drawn</td>
<td>Iron</td>
</tr>
<tr>
<td><strong>Other occurrence or event without observable indicators in the water</strong></td>
<td>Arsenic</td>
</tr>
<tr>
<td>†Arsenic suspected or detected in the aquifer</td>
<td>Arsenic</td>
</tr>
<tr>
<td>†Uranium suspected or detected in the aquifer</td>
<td>Uranium</td>
</tr>
<tr>
<td>†High fluoride suspected or detected in the aquifer</td>
<td>Fluoride</td>
</tr>
<tr>
<td>†Heavy fertilization in close proximity to the water source or well</td>
<td>Nitrate</td>
</tr>
<tr>
<td>†Animal manure in close proximity to the water source or well</td>
<td>Nitrate and coliform or E. coli bacteria</td>
</tr>
<tr>
<td>†Use, storage, or mixing of herbicide, insecticide, rodenticide, or fungicide in close proximity to the water source or well</td>
<td>Herbicide, insecticide, rodenticide, or fungicide identified</td>
</tr>
<tr>
<td>†Dry-cleaning operation, private dump, junkyard, landfill, manufacturing facility, or gas station in close proximity to the water source or well</td>
<td>Volatile organic chemicals and heavy metals</td>
</tr>
<tr>
<td>†Possible incomplete sewage treatment due to failing septic system in close proximity to the water source or well</td>
<td>Nitrate and Coliform or E. coli bacteria</td>
</tr>
<tr>
<td>†Contaminant detected in nearby private or public well</td>
<td>Contaminant identified</td>
</tr>
<tr>
<td>†Household contains lead or brass plumbing</td>
<td>Lead</td>
</tr>
<tr>
<td>†Recurring gastrointestinal illness of residents, or gastrointestinal illness of visitors</td>
<td>Coliform or E. coli bacteria</td>
</tr>
</tbody>
</table>
sources or through well defects. To assess the year-round safety of drinking water, test for bacteria in the late spring or early summer during wet weather. Testing during extremely dry weather or when the ground is frozen may be less desirable. Lack of moisture migration through the soil reduces the likelihood of finding high contaminant levels.

The best location to collect a water sample is at the tap used most frequently for drinking and cooking. If contaminants are found, inspect the water system for defects and, if necessary, collect additional samples at other locations to determine if the impurities are entering at the well or through defects in the plumbing system.

Take care when sampling for bacterial contaminants. Because bacteria are commonly carried on dust and dirt particles, avoid drawing a sample in extremely dirty locations where dust could accidentally enter the sterile sample container. Clean, indoor locations are best. If an outdoor sampling location must be used, avoid drawing samples from frost-proof hydrants. The buried valve allowing them to drain and avoid freezing can allow bacterially-contaminated water to be drawn into the riser pipe leading to the hydrant. Do not touch the inside of the bottle or lid when collecting the sample. Most laboratories recommend removing the aerator from an interior faucet before collecting a bacteria water sample, and some recommend disinfecting the faucet with heat or chlorine before collection. Follow directions carefully or solicit the services of a professional.

Testing for Other Suspected Contaminants

Testing for nitrate and bacteria does not guarantee the water is safe, as other contaminants could be present. Aquifers, which supply groundwater, are vulnerable to many types of contamination. Contaminants can enter aquifers and groundwater from septic systems, landfills, fertilizers and pesticides, sewage, animal waste, fuel storage tanks, and many other sources. Even distant contamination can negatively impact a water supply given time, as groundwater moves slowly. In addition, some contaminants are introduced to groundwater from naturally occurring sources such as the rock and minerals that make up the aquifer. Test for substances when specific contamination is suspected. This might be the result of a spill, backflow, use of product in close proximity to the well or other such event. If any contaminant is detected in a nearby private or public well, private water users in close proximity should consider testing their water supply for the contaminant. Collect a water sample at a time when the suspected contaminant is most likely to be present if this information is known. The information in Table 2 may be helpful in determining what analysis to request for private drinking water.

Options for Having Water Tested

Many Nebraska laboratories offer testing services, including water analyses. Some laboratories are operated by government agencies; others are private commercial laboratories. Some agencies and organizations may offer limited screening tests outside of a laboratory setting.

Other sources of water testing include water treatment equipment dealers who often provide testing services through contracts with private laboratories or with the use of test kits. You also may purchase do-it-yourself test kits. Tests done in the home, either by a water equipment dealer or yourself, are usually for nuisance contaminants such as hardness and total dissolved solids. In-home demonstrations that cause precipitates to form in water or cause color changes can be dramatic but may not provide useful, accurate information. Greater reliability and accuracy can be expected with laboratory testing. However, results from test kits may indicate the need for a more accurate analysis.

The Nebraska DHHS approves laboratories to test drinking water samples. Not all laboratories are approved to test for all drinking water contaminants. Rather, approval must be obtained for each specific contaminant. To receive approval for a contaminant, a laboratory must use approved testing methods and equipment.

Approval provides some assurance that the laboratory has the capability to perform water quality analysis within an acceptable range of accuracy and will provide reliable results. It does not guarantee a specific water sample analysis has been or will be performed accurately. Use an approved laboratory when accurate, reliable test results are needed and any time test results might be used for legal action involving contamination. In this case, the strongest evidence is presented when an independent party collects the sample, documents the correct and appropriate sampling procedure, and delivers the sample to the approved laboratory.

Non-approved laboratories may use the same equipment and procedures as approved laboratories and may provide accurate analysis, but there is no independent information about the laboratory’s ability to obtain reliable results. When results from a non-approved laboratory indicate a contaminant concentration may affect human health, a second analysis performed by an approved laboratory is advisable. In situations where considerable investment is necessary to correct a nuisance or groundwater contamination problem, verification of the severity of the problem by an approved laboratory may be advisable.

The Nebraska DHHS Public Health Laboratory either is approved or has a contract with an approved laboratory.
to test for every EPA publicly regulated contaminant. In
addition, it can provide information on request regarding
all laboratories located and approved in Nebraska, and
can provide information on the specific contaminants for
which each is approved. For more information contact:

Nebraska Department of Health and Human Services
3701 South 14th
Lincoln, NE 68502
402–471–8407

Always contact the individual laboratory and discuss
the analysis desired. Ask about test fees, sampling bottles
or kits, and sampling instructions. Typically there is a fee
for each contaminant analyzed; however, some laboratories
offer package tests which include analysis for a number of
contaminants for a specified fee. For many contaminants,
many special sample containers, preservatives, and sam-
pling procedures must be used. Always follow sampling
instructions provided by the laboratory.

When it comes to private drinking water wells, DHHS
regulates water well construction and location, but it does
not regulate the safety or quality of water provided by pri-
vate wells. In addition, while the EPA has the authority to
enforce Safe Drinking Water Act standards for public water
supplies, it does not have the authority to regulate the safe-
ty or quality of water provided by private wells. Counties or
cities may regulate the safety or quality of water provided
by private wells. Thus, the quality and safety of water pro-
vided by private wells in Nebraska is not regulated and is at
the discretion of the water user except in counties or cities
where regulations exist. Since EPA drinking water stan-
dards are designed to ensure safe drinking water for public
water supply users, the standards can serve as a voluntary
guide for private system users evaluating the safety of their
drinking water.

In addition, water test results provide valuable infor-
mation from which to make informed decisions. Users of
private drinking water can compare their water test results
with the EPA water quality guidelines to assess the quality
and risk associated with their water supply. Some lending
agencies may require a private water supply meet Safe
Drinking Water Act nitrate and bacteria standards prior to
approving a real estate loan.

Summary

All water from natural sources contains dissolved sub-
stances. At high enough concentrations, some substances
may be harmful. The only way to know if water contains
potentially harmful substances at levels high enough to
be of concern is for the water to be tested. The quality of
public water supplies is regulated by the EPA Safe Drinking
Water Act. Public drinking water supplies must be tested
for nearly 100 potential contaminants. The quality of pri-
vate water supplies is not regulated in Nebraska by federal
or state mandates. Testing private water supplies is highly
recommended but is entirely at the discretion of the water
user except in county or city jurisdictions where local reg-
ulations mandating testing apply. There is no single test to
determine the safety of private drinking water. Generally,
private water supplies should be tested annually for nitrate
and bacterial contamination, and as needed for other sus-
ppected contaminants.

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