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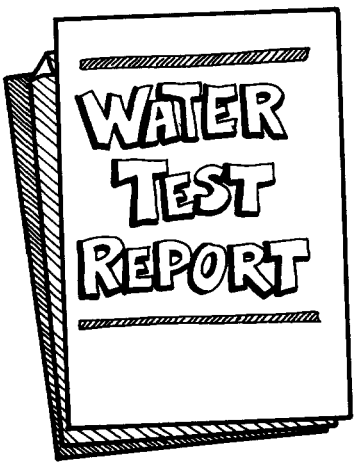

INTERPRETING YOUR WATER TEST REPORT

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Your water's appearance and odor may give an indication of its quality. However, having a test run on your water is the only sure way of determining quality.

Types of Water Tests

The two common types of tests made on water samples are a **bacterial analysis**, to determine the presence of coliform bacteria, and a **mineral analysis**, to determine the dissolved minerals in the water.

A bacteria analysis requires the use of a sterile container and sampling instructions obtained from the laboratory where the test will be performed. The laboratory report will indicate the presence or absence of coliform bacteria in the sample. Coliform bacteria are present in the intestinal tract of warm blooded animals, including humans. Most coliform bacteria do not cause disease by themselves, but their presence in a water sample indicates probable contamination of the water supply and the possible presence of disease organisms.

A mineral or chemical analysis will require a ıart of water in a clean plastic or glass container. ɔ not use a plastic container which has held ıbstances such as bleach, soap or vinegar as the ımple will be contaminated. A plastic distilled water container or a container especially for water samples is best. Do not use a metal container.

The mineral analysis will identify dissolved minerals in the water supply. Some of the constituents may pose a health risk while others affect the suitability for washing or other household uses. Mineral constituents are commonly reported in numerical form, giving the concentration by weight but in volumetric form such as mg/l (milligrams of mineral constituent per liter of water). Some laboratories report in ppm (parts per million or pounds of mineral constituent per million pounds of water). For all practical purposes the two measurements are the same (ppm = mg/l).

Interpreting A Bacteriological Test

The laboratory will commonly report the bacteriological test as being satisfactory or not satisfactory or as testing positive or not positive for coliform bacteria. A satisfactory (not positive) rating would mean the water is safe for human consumption from a bacteriological standpoint. The test may also report the numerical values relating to the number of coliform bacteria. Current drinking water standards indicate that where samples are checked at intervals less often than once per month the coliform bacteria count should be less than 1 per 100 ml (milliliters) of water ($<$1/100 ml. water).

Interpreting A Mineral Analysis

The following is a list of common mineral constituents found in North Dakota waters and their commonly acceptable ranges for household use.

pH: pH is a measure of the hydrogen ion concentration in water. The pH of water indicates whether the water is acid or alkaline. The measurement of pH ranges from 1 to 14 with a pH of 7 indicating a neutral condition (neither acid nor alkaline). Numbers lower than 7 indicate acidity; numbers higher than 7 indicate alkalinity. Drinking water with a pH between 6.5 and 8.5 is generally

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considered satisfactory. Acid waters tend to be corrosive to plumbing and faucets, particularly if the pH is below 6. Alkaline waters are less corrosive. Waters with a pH above 8.5 may tend to have a bitter or soda like taste. The pH of water may have an effect on the treatment of water and also should be considered if the water is used for field application of pesticides. Water with a pH of 7.0 to 8.5 will require more chlorine for the destruction of pathogens (disease organisms) than will water that is slightly acid.

Conductivity: Conductivity is a measure of the conductance of water to an electric current. Conductivity is commonly reported as umhos/cm (micromhos per centimeter). This is an easy measurement to make and relates closely to the total dissolved solids content of water. The total dissolved solids is approximately 70 percent of the conductivity in umhos/cm.

Total Dissolved Solids: High concentrations of total dissolved solids (TDS) may cause adverse taste effects. Highly mineralized water may also deteriorate domestic plumbing and appliances. It is recommended that waters containing more than 500 mg/l of dissolved solids not be used if other less mineralized supplies are available. This does not mean water containing more than 500 mg/l TDS is unusable. Exclusive of most treated public water supplies, the Missouri River, a few fresh water lakes and scattered wells, very few water supplies in North Dakota contain less than the recommended 500 mg/l concentration of total dissolved solids. Many households in the state use drinking water supplies with concentrations of 2000 mg/l and greater.

Total Hardness: Hardness is the property which makes water form an insoluble curd with soap and is primarily due to the presence of calcium and magnesium. Waters which are very hard have no known adverse health effects and may be more palatable than soft waters. Hard water is primarily of concern because it requires more soap for effective cleaning, forms scum and curd, causes yellowing of fabrics, toughens vegetables cooked in the water and forms scales in boilers, water heaters, pipes and cooking utensils.

The hardness of good quality water should not exceed 270 mg/l (15.5 gr/gal) measured as calcium carbonate. Waters softer than 30-50 mg/l may be corrosive to piping depending on pH, alkalinity and dissolved oxygen.

Chloride: High concentrations of chloride ions may result in an objectionable salty taste to water and the corrosion of plumbing in the hot water system. High chloride waters may also produce a laxative effect. An upper limit of 250 mg/l has been set for the chloride ions, although at this limit few people will notice the taste. Higher concentrations do not appear to cause adverse health effects. An increase in the normal chloride content of your water may indicate possible pollution from human sewage, animal manure or industrial wastes.

Alkalinity: Alkalinity is a measure of the capacity of water to neutralize acids. The predominant chemical system present in natural waters is one where carbonates, bicarbonates and hydroxides are present. The bicarbonate ion is usually prevalent. However, the ratio of these ions is a function of pH, mineral composition, temperature and ionic strength. A water may have a low alkalinity rating but a relatively high pH or vice versa, so alkalinity alone is not of major importance as a measure of water quality. Alkalinity is not considered detrimental to humans but is generally associated with high pH values, hardness and excess dissolved solids. High alkalinity waters may also have a distinctly flat, unpleasant taste.

Nitrate: Nitrate (NO_3) levels should not be higher than 10 mg/l if reported as nitrogen (N) or nitrate-nitrogen ($N\text{-}NO_3$) or higher than 45 mg/l if reported as nitrate (NO_3). High nitrate may cause methemoglobinemia (infant cyanosis or "blue baby disease") in infants who drink water or formula made from water containing nitrate levels higher than recommended. Adults can drink water with considerably higher concentrations than infants without adverse affects. Livestock water can contain up to 100 mg/l of nitrate-nitrogen, but young monogastric animals such as hogs may be affected at nitrate levels of considerably less than 100 mg/l.

Fluoride: At concentrations greater than 1.0 mg/l, fluoride will reduce the incidence of dental cavities. At concentrations over 1.5 mg/l, fluorosis (mottling) of teeth may occur. Most municipal water supplies have added fluoride to reach the optimal level of 1.2 mg/l to reduce cavities. Some water supplies in North Dakota contain naturally occurring fluoride in amounts high enough to cause mottling of the teeth.

Turbidity: Turbidity is a measure of light transmission and indicates the presence of suspended material such as clay, silt, finely divided organic material, plankton and other inorganic material. Turbidities in excess of 5 are usually objectionable for aesthetic reasons. If turbitity is high, be aware of possible bacterial contamination.

Calcium and Magnesium: Calcium and magnesium are important contributors to water hardness. When water is heated they break down and precipitate out of solution, forming scale. Maximum limits have not been established. Magnesium concentrations greater than 125 mg/l may have a laxative effect on some people.

Iron and Manganese: Iron in concentrations greater than 0.3 mg/l and manganese in concentrations greater than 0.05 mg/l may cause brown and

black stains on laundry, plumbing fixtures and sinks. A metallic taste may also be present and it may affect the taste of beverages made from the water. High concentrations of iron and manganese do not appear to present a health hazard.

Potassium: Potassium concentrations in water are generally very small. Although excessive intakes may have a laxative effect, public health authorities have not established a maximum limit.

Sodium: Sodium is a very active metal which does not occur naturally in a free state. It is always combined with other substances. In the human body sodium helps maintain water balance. Human intake of sodium is mainly influenced by the consumption of sodium as sodium chloride or table salt. The contribution of drinking water is normally small compared to other sources. The treatment for certain heart conditions, circulatory or kidney diseases or cirrhosis of the liver may include sodium restriction. Diets for these persons should be designed with the sodium content of their drinking water taken into account. The National Academy of Sciences has suggested a standard for public water allowing no more than 100mg/l of sodium. This would insure that the water supply adds no more than 10 percent of the average person's total sodium intake. The American Health Association has recommended a more conservative standard of 20 mg/l to protect heart and kidney patients.

High concentrations of sodium will reduce the suitability of water for irrigation or house plant watering use. High sodium water will alter the soil chemistry and absorption properties, eventually sealing the soil surface.

Softening water by the ion exchange or lime-soda ash processes will increase the sodium content. Softening by ion exchange will increase the sodium content approximately 8 mg/l for each gr/gal (grains per gallon) of hardness removed.

Sulfates: Water containing high levels of sulfates, particularity magnesium sulfate (Epsom salts) and sodium sulfates (Glauber's salt) may have a laxative effect on persons unaccustomed to the water. These effects vary with the person and appear to last only until one becomes accustomed to using the water. High sulfate content also affects the taste of water and will form a hard scale in boilers and heat exchangers. For these reasons the upper recommended limit for sulfates is 250 mg/l.

Testing Laboratories:

The North Dakota State Health Department and several local health department laboratories perform bacterial analysis of water samples. Secure a sterile container and directions from the laboratory to be used. The North Dakota State Health Department and several private laboratories in the state perform mineral analysis.

The following address and telephone number is for the State Health Department laboratory where **bacterial analysis** is done.

North Dakota State Department of Health and
Consolidated Laboratories
Microbiology Division
1205 Avenue A West
P. O. Box 5520
Bismarck, ND 58502
Telephone: 224-2384

The following address and telephone number is for the State Health Department laboratory where **mineral analysis** is done.

North Dakota State Department of Health and
Consolidated Laboratories
Chemistry Division
2635 East Main
P. O. Box 937
Bismarck, ND 58501
Telephone: 221-6142

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