Virginia Household Water Quality Program
Drinking Water Clinic
Interpretation Sheet

Units

The level of most contaminants is reported on your water test in milligrams per liter (mg/l). One mg/l is equivalent to 1 part per million (ppm). To visualize this, about 4 drops of ink in a 55 gallon barrel of water results in an "ink concentration" of 1 ppm or 1 mg/l.

Contaminant Levels

The Environmental Protection Agency (EPA) sets either a Maximum Contaminant Level (MCL) or Secondary Contaminant Level for each contaminant. A Maximum Contaminant Level is a legally enforceable national standard set by the EPA to protect the public from exposure to health hazards in water. These standards apply to public drinking water systems, but serve as a good guide for private systems. Secondary Maximum Contaminant Levels are concentration limits for nuisance contaminants and physical problems. Governments do not enforce these standards for private systems such as wells and springs; they are only useful guidelines for individual water supplies.

Possible Water Contaminants

Iron

Iron in water does not usually present a health risk. It can, however, be objectionable if present in amounts greater than 0.3 mg/l. Excessive iron levels can leave red-orange-brown stains on plumbing fixtures and laundry. It may give water and beverages a bitter, metallic taste and discolor beverages.

Manganese

Manganese does not present a health risk in drinking water. However, if present in amounts greater than 0.05 mg/l, it may give water a bitter taste and produce black stains on laundry, cooking utensils or plumbing fixtures.

Hardness

Hardness is a measure of calcium and magnesium in water. Hard water does not present a health risk, but does keep soap from lathering, decreases cleaning action of soaps and detergents, can leave soap scum on plumbing fixtures, and leaves scale deposits on water pipes and hot water heaters. Softening treatment is highly recommended for very hard water (above 180 mg/l), and may be considered for hardness levels ranging from 60 to 180 mg/L. Water with a hardness concentration of about 60 mg/l or less probably does not need softening. Water hardness is sometimes reported in units of grains per gallon, or gpg, where 1 gpg is equivalent to about 17.1 mg/l hardness). In all but extremely hard water situations, it may be desirable to soften only the hot water.

Sulfate

High sulfate concentrations may result in adverse taste, and may have a laxative effect on those who are unaccustomed to drinking high sulfate water. The Secondary Maximum Contaminant Level for sulfate is 250 mg/l. Sulfates are often naturally present in groundwater, and may be linked to other sulfur-related problems, such as hydrogen sulfide gas, which gives water a "rotten-egg" odor or taste. Hydrogen sulfide gas occurs naturally as a result of the activities of sulfur-reducing bacteria, which feed on small amounts of sulfur in water and thrive in low oxygen environments common in groundwater wells. These bacteria may cause an unpleasant taste or odor, but they do not present a health threat to humans. While it is difficult to test for hydrogen sulfide gas in water, it is easily detected by smell, especially in hot water. Water containing this

gas may also corrode iron and other metals in the water system as well as stain plumbing fixtures and cooking utensils.

Chloride

Chloride in drinking water is not a health risk. Natural levels of chlorides are low. High levels in drinking water usually indicate contamination from a septic system, road salts, fertilizers, industry or animal wastes. High levels of chloride may speed corrosion rates of metal pipes, causing pitting or darkening of stainless steel. The EPA has set a Secondary Maximum Contaminant Level of 250 mg/l for chloride.

Fluoride

Fluoride is a concern because of its effect on teeth and gums. Small concentrations of fluoride are considered to be beneficial in preventing tooth decay while moderate amounts can cause brownish discoloration of teeth and high fluoride concentrations can lead to tooth and bone damage. For these reasons, the EPA has set a Secondary Maximum Contaminant Level and a Maximum Contaminant Level of 2 and 4 mg/l, respectively.

Total Dissolved Solids

High concentrations of dissolved solids may cause adverse taste effects and may also lead to increased deterioration of household plumbing and appliances. The EPA Secondary Maximum Contaminant Level is 500 mg/l for total dissolved solids.

pH

The pH of water indicates whether it is acidic (below 7.0) or alkaline (above 7.0). Acidic water can cause corrosion of pipes, and may cause toxic metals from plumbing systems, such as copper or lead, to be dissolved in drinking water. Dissolved copper may give water a bitter or metallic taste, and produce blue-green stains on plumbing fixtures. The life of plumbing systems may be shortened due to corrosion, requiring expensive repair or replacement of water pipes and fixtures. The use of plastic pipes approved by the National Sanitation Foundation (NSF) throughout the water distribution system should lessen these concerns. Water with a pH below 6.5 is considered acidic enough to require treatment. Alkaline water with a pH above 8.5 is rarely found naturally, and may indicate contamination by alkaline industrial wastes. The EPA has set a suggested range of between 6.5 and 8.5 on the pH scale for drinking water.

Saturation Index

The (Langlier) Saturation index, in addition to pH, is used to evaluate the extent of potential corrosion of metal pipes and plumbing fixtures. It is a calculated value based on the calcium concentration, total dissolved solids concentration, measured pH, and alkalinity. It is a measure of the scale formation potential of the water.

- A saturation index greater than zero indicates that calcium carbonate deposits may readily form on pipe walls
- A saturation index less than zero indicates that water does not have scale-forming properties, so pipes may be subject to corrosion.
- Saturation index numbers between +1 and -1 are considered acceptable for household water supplies.

Values of less than -1 are not a concern IF the water has a pH of 7.0 or above (not acidic). People who use a water softener may note a saturation index reading lower than desired. While these treatment devices correct hardness, they may enhance the corrosion potential of the water. Concerns about resulting drinking water quality may be lessened by softening only the hot water or bypassing drinking water lines.

Copper
The EPA drinking water standard for copper is 1.3 mg/l, based on concerns about acute gastrointestinal illness. Since dissolved copper also leaves blue-green stains on plumbing fixtures, a Secondary Maximum Contaminant Level of 1.0 mg/l is also provided for copper. While copper in household water most often comes from the corrosion of brass and copper plumbing materials, this type of contamination is in not likely to be detected under the sampling procedure following in this program, which calls for flushing the water lines. Therefore, any excessive amounts of copper from the water source itself may indicate contamination from industrial wastes, dumps or landfills.

Sodium
Excessive sodium has been linked to problems with high blood pressure, heart and kidney diseases. Moderate quantities of sodium in drinking water are not considered harmful since an individual normally receives most (over 90%) of his or her sodium intake from food. For those on low-sodium diets, both the American Heart Association and EPA suggest 20 mg/l as a maximum level for sodium in drinking water, but a physician should be contacted in individual cases. Water softening by ion exchange will increase sodium levels in water. To reduce sodium in drinking water requiring such treatment, soften only the hot water or bypass drinking water lines.

Nitrate
High levels of nitrate may cause methemoglobinemia or "blue-baby" disease in infants. Though the EPA has set a Maximum Contaminant Level for nitrate-nitrogen of 10 mg/l, they suggest that water with greater than 1 mg/l be used with caution for feeding infants. Levels of higher than 3 mg/l may indicate excessive contamination of water supply by commercial fertilizers or organic wastes from septic systems or farm animal operations.

Total Coliform Bacteria
Microbiological contamination of drinking water can cause short-term gastrointestinal disorders, resulting in cramps and diarrhea that may be mild to very severe. While coliform bacteria do not cause disease, they are indicators of the possible presence of disease bacteria, so their presence in drinking water warrants additional testing. Coliform bacteria are always present in the digestive systems of humans and animals and could also come from other sources such as soil or decaying vegetation. Analysis for total coliform bacteria is the EPA standard test for microbiological contamination of a water supply. Total coliform levels on water test results are represented by either "presence" or "absence", or in number of colonies per 100 ml.

E. Coli
In the event that there are coliform bacteria present, a test for fecal bacteria, such as E. coli, is necessary to determine whether or not any bacteria are from human or animal waste. A positive E. coli result is much more serious than coliform bacteria alone because it indicates that human or animal waste is entering the water supply. Most strains of E. coli are harmless, but a few strains can produce a powerful toxin and can cause severe illness. If E. coli is present in your water supply, don't panic. You and your family may have developed an immunity to the bacteria, and may not have suffered any ill effects thus far. However, learning that your water supply is contaminated with bacteria should encourage you to take action and find out more about treatment possibilities.

This interpretation sheet was adapted from a version compiled by Blake Ross, Extension Agricultural Engineer and Kathy Parrott, Extension Specialist, Housing, Virginia Tech, Blacksburg, VA 2003.