Water Quality Definitions

Turbidity: (County Test) The presence of suspended material such as finely divided organic material, clay, silt, and other inorganic material in water is known as turbidity. Turbidity is tested by measuring the amount of light scattered by particles in the water. As the number of particles increases, more light is scattered and a higher turbidity reading is obtained. The measuring instrument is called a nephelometer, and the readings are expressed as nephelometric turbidity units (NTU) or turbidity units. Turbidity in excess of 5 NTU is easily detected in a glass of water and is usually objectionable for aesthetic reasons.
Excessive turbidity is a problem for several reasons:
1. It protects microorganisms from chlorine and other disinfectants;
2. It acts as a food source for microorganisms, allowing them to survive and multiply;
3. It interferes with the maintenance of a chlorine residual;
4. It interferes with the test for coliform bacteria.

Clay or other inert suspended particles in drinking water drawn from ground-water sources may not adversely affect health, but water containing such particles may require treatment to make it aesthetically suitable for its intended use. Following a rainfall, variations in ground-water turbidity may be considered an indication of surface or other introduced pollution. Excessive turbidity must be removed by filtration.

Color: (County) Dissolved organic material from decaying vegetation and certain inorganic matter can cause color in water. Although color itself is not usually objectionable from a health standpoint, its presence is aesthetically objectionable and suggests that the water needs appropriate treatment.

Odor: (County) Odor in water can be caused by foreign matter such as organic compounds, inorganic salts, or dissolved gases. These contaminants may come from domestic, agricultural, or natural sources. Water should be free from any objectionable taste or odor at the point of use.

Detergents & Foamability: (County/FHA) Many natural and man-made substances will cause foam when water is agitated. The major cause of foaming is surfactants, which are synthetic organic chemicals used as the principal ingredient in modern detergents. Foaming is an undesirable property of drinking water because foaming agents may impart an unpleasant taste, cause frothing, and usually can be associated with contamination of ground water. Foaming substances can be removed by conventional treatment consisting of coagulation/flocculation, sedimentation, and filtration, or by activated carbon.

Chlorides: (County) Most waters contain some chloride. It can be caused by the leaching of marine sedimentary deposits and by pollution from seawater, brine or industrial and domestic wastes. Chloride concentrations in excess of about 250 mg/l usually produce a noticeable taste in drinking water. An increase in chloride content may indicate possible pollution from sewage sources, particularly if the normal chloride content is know to be low. Where only waters of very high natural chloride content are available, reverse-osmosis or electrodialysis units may be used to produce potable water.

Iron: (County/FHA) Small amounts of iron are frequently present in water because iron is present in the soil and because corrosive water will pick up iron from unprotected pipes. The presence of iron in water is considered objectionable because it imparts a brownish color to laundered goods and affects the taste of beverages such as tea and coffee. The Pa. DEP MCL for iron is 0.30 mg/l. A variety of methods are available for iron removal. Conventional treatment consisting of coagulation/flocculation, sedimentation, and filtration are generally effective. Chemical oxidation or aeration followed by filtration may also be required, and certain softening processes can be used.

Manganese: (County) There are two reasons for limiting the concentration of manganese in drinking water: 1) to prevent aesthetic and economic damage to property and 2) to avoid any possible physiological effects from excessive intake. The domestic water user finds that manganese produces a blackish color in laundered goods and affects the taste of beverages, including coffee and tea. The Pa. DEP limit for manganese is 0.05 mg/l. Essentially the same treatment processes used to remove iron are used to reduce manganese levels. However, manganese is harder to remove than iron, because its precipitation is more pH dependent.

Nitrates & Nitrites: (Nitrates & Nitrites - FHA) (Nitrates – County) Nitrate (NO) can cause methemoglobinemia (infant cyanosis, or "blue baby disease") in infants who have been given water or fed formulas prepared with water having a high nitrate concentration. A domestic water supply should not contain nitrate concentrations in excess of 10 mg/l (expressed as nitrogen). High levels found in shallow wells may be an indication of seepage from septic systems or livestock manure deposits. In some polluted wells, nitrite (NO_2) will also be present in concentrations greater than 1 mg/l and is even more hazardous to infants. When the presence of high nitrite concentration is suspected, the water should not be used for infant feeding. Ion-exchange and reverse osmosis can be used to remove excess nitrate and nitrite.

pH: (County/FHA) pH is a measure of the hydrogen ion concentration in water. It is also an indication of acid or alkaline content. The pH scale ranges from 0 to 14, with 7 indicating neutral water. Values less than 7 indicate sharply increasing acidity, and values greater than 7 indicate sharply increasing alkalinity. The pH of water in its natural state varies from 5.5 to 9.0. Determination of the pH value assists in the control of corrosion, the determination of proper chemical dosages, and adequate control of disinfection. The treatment processes used to control corrosivity and scaling involve pH adjustment.

Solids/Residue, Dissolved: (FHA) Total dissolved solids/residue is a measure of the water's content of various dissolved materials. Water with no dissolved solids usually has a flat taste, whereas water with more than 500 mg/l TDS usually has a disagreeably strong taste. Depending of the chemical nature of the dissolved solids, reverse osmosis, or lime soda softening may be used to reduce TDS content.

Lead: (FHA) Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver can all cause serious health problems. Lime-soda softening and reverse osmosis can both be used to reduce the concentrations of toxic metals. Precipitation with alum is also effective for certain metals.

Bacteriological Quality: (Micro/County/FHA) The specific disease-causing organisms present in water are not easily identified, and the techniques for comprehensive bacteriological examination are complex and time-consuming. It has been necessary; therefore, to develop tests that indicate the relative degree of contamination in terms of a single, easily performed test.

Because many of the microorganisms that cause disease in man are transmitted through the fecal wastes of infected individuals, the most widely used method of testing the bacteriological quality of water involves testing for a single group of bacteria that are always present when fecal contamination is present. This group of bacteria, the coliform group, inhabits the intestinal tract of man, but is also found in most domestic animals, birds, and certain wild species. The methods used to test specifically for coliform are the membrane filter test and the multiple-tube fermentation test. A third test, the standard plate count, determines the total number of bacteria in a sample that will grow under certain conditions.

Some ground-water sources, if properly protected and developed, can meet bacteriological drinking water standards without treatment. However, disinfection is a recommended safeguard for noncommunity systems and required treatment for community systems. Chlorination of ground water also introduces a disinfectant residual that helps maintain bacteriological quality of the water in the distribution system.

Water from surface sources should always be disinfected, usually by chlorination, before it is supplied to the public. For both ground and surface water, protection of the source from contamination should be an ongoing priority. In ground-water sources, iron bacteria can cause problems with staining and tastes and odors. Proper well-drilling procedures will prevent the entrance of iron bacteria into a new well, and iron bacteria in an existing well can usually be eliminated by temporarily introducing a high chlorine concentration.