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Drinking Water Standards[1]

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When you fill a glass with water from your tap, you expect to drink water that is safe and pure. However, gases, minerals, bacteria, metals or chemicals suspended or dissolved in your water can affect your health and influence the quality of your water.

Drinking water supplied by municipal water systems is monitored for many contaminants. As authorized by the 1974 Safe Drinking Water Act and its amendments, the U.S. Environmental Protection Agency (EPA) has established limits on the concentration of certain drinking water contaminants allowed in public water supplies. These limits, or standards, are set to protect your health and ensure that your water is of good quality. The Florida Department of Environmental Protection (FDEP) has accepted the National Standards as published herein.

Primary Drinking Water Standards

The EPA standards for drinking water fall into two categories-**Primary Standards** and **Secondary Standards**. Primary Standards are based on health considerations and are enforced by the EPA. They protect you from three classes of toxic pollutants: pathogens, radioactive elements and toxic chemicals. Primary Standards set a limit, called the **Maximum Contaminant Level (MCL)**, on the highest allowable concentration of a contaminant in drinking water supplied by municipal water systems. The MCL is usually expressed in milligrams per liter (mg/L).

When there is no reliable method that is economically and technically feasible to measure a contaminant at particularly low concentrations, a **Treatment Technique (TT)** is set rather than an MCL. A treatment technique **(TT)** is an enforceable procedure or level of technological performance which public water systems must follow to ensure control of a contaminant. Refer to ***TT Footnotes*** for an EPA explanation of specific Treatment Techniques.

Table 1 contains the current primary drinking water standards.

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Secondary Drinking Water Standards

Secondary Standards regulate contaminants that cause offensive taste, odor, color, corrosivity, foaming and staining. The concentration limit is called the **Secondary Maximum Contaminant Level (SMCL)**. Secondary Standards are not enforced. They are guidelines for water treatment plant operators and state governments attempting to provide communities with the best quality water possible.

Table 2 lists the current secondary drinking water standards.

How Standards Are Set

EPA regulators develop Primary Standards for drinking water contaminants based on three criteria:

- The contaminant causes adverse health effects.
- It is detectable in drinking water.
- It is known to occur in drinking water.

In setting Primary Standards for a drinking water contaminant the government first looks at all the toxicological data on that contaminant, usually obtained from acute and chronic animal studies. Occasionally human clinical or epidemiological data are also available. Experts use this information to estimate the concentration of a drinking water contaminant that may be toxic and the concentrations, if any, that may cause no adverse effects.

Because the levels of contaminants found in drinking water are seldom high enough to cause acute health effects, health officials are most concerned about chronic health effects such as cancer, birth defects, miscarriages, nervous system disorders, and organ damage. These health effects may occur after prolonged exposure to small amounts of a substance. In addition, when regulators set drinking water standards, they treat substances that cause cancer (carcinogens) differently from contaminants that cause other health effects.

If a Chemical Does Not Cause Cancer

Officials set standards using a figure calculated from animal studies called the **Acceptable Daily Intake (ADI)** for chemicals that cause adverse health effects other than cancer. The ADI is the daily dose of a substance that a person can ingest over a lifetime without suffering any adverse health effects and it includes a conservative safety margin.

Maximum Contaminant Level Goal (MCLG). Regulators use the ADI to establish a **Maximum Contaminant Level Goal (MCLG)** for a contaminant. The MCLG is the concentration of a contaminant that experts believe a person can drink safely over a lifetime. It is based entirely on health considerations and, as a health goal, is set at a level where no adverse health effects should occur. The MCLG, which is not enforced by the EPA, is used to set enforceable drinking water standards.

Maximum Contaminant Level (MCL). The **MCL**, the Primary Standard enforced by the EPA, is set as close as possible to the MCLG. In setting an MCL, EPA regulators consider, in addition to health effects, the feasibility and the combined cost of analyzing water for a contaminant and for treating water to remove the contaminant. Therefore, the MCL is often less stringent than the MCLG.

If a Chemical Causes Cancer

In setting Primary Standards for chemicals believed to cause cancer, regulators assume that no concentration is safe. Consequently, the MCLG is set at zero. But, a zero level is not always possible to achieve, so regulators estimate toxicity by calculating a figure called a **Risk Estimate.**

The Risk Estimate. In theory, any concentration of a carcinogen in your drinking water may possibly cause cancer. In practice, however, at very low concentrations the risk of cancer becomes so small that it is considered negligible. Therefore, regulators must decide what level of risk is acceptable. It may be one excess cancer in 10,000 persons or one excess cancer in 1 million persons exposed over a lifetime (70 years). The concentration of chemical estimated to cause this "acceptable level" of risk is the **Risk Estimate.**

Drinking Water Standards Are Not Absolute

Setting drinking water standards is an imperfect process, rarely based on conclusive human evidence. 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 for many years. In addition, regulatory decisions frequently incorporate economic, political and social considerations.

Therefore, it is important to understand that Primary Standards for drinking water contaminants do not guarantee that water with a contaminant level below the standard is risk-free, nor do they mean that water with a higher level is unsafe. The standards also do not take into account the possible presence of other chemicals, which may increase or decrease the toxicity of the contaminant.

Current Drinking Water Standards

The EPA has set MCLs for total trihalomethanes, pesticides, volatile organic chemicals, inorganic contaminants, microbial contaminants and radionuclides (Table 1). The EPA periodically issues standards for additional organic and inorganic chemicals, microbes and viruses. Many more organic chemicals known to be present in drinking water are not currently regulated by either state or Federal standards.

Working through state governments, the EPA monitors community drinking water. When a standard is exceeded, the EPA requires that the contaminant levels be reduced to the MCL. The corrective treatment is left to the individual water system, usually a private utility.

State Responsibilities

Ultimately, regulatory officials in your state set and enforce drinking water standards for EPA-regulated contaminants and for other contaminants. Florida, for example, has set standards for commonly used pesticides and New York has joined other states in setting guidelines for organic chemicals not already regulated in drinking water supplies. However, states are not permitted to set standards that are less stringent than the MCLs set by the EPA.

Drinking water standards represent conservative judgements of scientists and regulators and are based on all available information on the health effects of drinking water contaminants. Although current drinking water standards do not guarantee that the glass of water you draw from your tap will be absolutely safe and pure, they do reflect sound scientific judgment and are based on all the knowledge that is available.

TT Footnotes from EPA on Treatment Technique

1. Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

2. Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

3. Treatment Technique (TT) - A required process intended to reduce the level of a contaminant in drinking water.

4. Units are in milligrams per Liter (mg/L) unless otherwise noted.

5. MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. The standard for this contaminant was set prior to 1986. Therefore, there is no MCLG for this contaminant.

6. Lead and copper are regulated using a Treatment Technique which requires systems to control the corrosiveness of their water. The action level serves as a trigger for water systems to take additional treatment steps if exceeded in more than 10% of tap water samples. For copper, the action level is 1.3 mg/L, and for lead is 0.015mg/L.

7. Each water system must certify, in writing, to the state that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

8. The Surface Water Treatment Rule requires systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or provide the same level of treatment as those who filter. Treatment must reduce the levels of *Giardia lamblia* (parasite) by 99.9% and viruses by 99.99%. *Legionella* (bacteria) has no limit, but EPA believes that if *Giardia* and viruses are inactivated, *Legionella* will also be controlled. At no time can turbidity (cloudiness of water) go above 5 nephelometric turbidity units (NTU) [systems that filter must ensure that the turbidity is no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples for any single month]; HPC-no more than 500 bacterial colonies per milliliter.

9. Legionnaire's Disease occurs when aerosols containing *Legionella* are inhaled by susceptible persons, not when people drink water containing *Legionella*. (Aerosols may come from showers, hot water taps, whirlpools and heat rejection equipment such as cooling towers and air conditioners.) Some types of *Legionella* can cause a type of pneumonia called Legionaire's Disease. *Legionella* can also cause a much less severe disease called Pontiac Fever. The symptoms of Pontiac Fever may include muscle pain, headache, coughing, nausea, dizziness and other symptoms.

10. No more than 5.0% of samples may be total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample may be total coliform-positive during a month). Every sample that has total coliforms must be analyzed for either *E. coli* or fecal coliforms to determine whether human or animal fecal matter is present (fecal coliform and E. coli are part of the total coliform group).

11. Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

Table 1. National Primary Drinking Water Standards

Contaminant	Maximum level	Contaminant	Maximum level
Inorganics		***Organics (cont.)***	
Antimony	0.006 mg/L	Diquat	0.02 mg/L
Arsenic	0.05 mg/L	Endothall	0.1 mg/L
Asbestos	7 million fibers/L	Endrin	0.002 mg/L
Barium	2 mg/L	Epichlorohydrin	TT5
Beryllium	0.004 mg/L	Ethylbenzene	0.7 mg/L
Cadmium	0.005 mg/L	Ethylene dibromide	0.00005 mg/L
Chromium (total)	0.1 mg/L	Glyphosphate	0.7 mg/L
Copper	1.3 mg/L TT6	Heptachlor	0.0004 mg/L
Cyanide (as free cyanide)	0.2 mg/L	Heptachlor epoxide	0.0002 mg/L
Flouride	4.0 mg/L	Hexachlorobenzene	0.001 mg/L
Lead	0.015 mg/L TT6	Hexachlorocyclopentadiene	0.05 mg/L
Mercury (Inorganic)	0.002 mg/L	Lindane	0.0002 mg/L
Nitrate (as N)	10 mg/L	Methoxychlor	0.04 mg/L
Nitrite (as N)	1 mg/L	Oxamyl (Vydate)	0.2 mg/L
Selenium	0.05 mg/l	Polychlorinated biphenyls (PCBs)	0.0005 mg/L
Thallium	0.002 mg/L	Pentachlorophenol	0.001 mg/L
Organics		Picloram	0.5 mg/L
Acrylamide	TT5	Simazine	0.004 mg/L
Alachlor	0.002 mg/L	Styrene	0.1 mg/L
Atrazine	*0.003 mg/L*	Tetrachloroethylene	0.005 mg/L
Benzene	0.005 mg/L	Toluene	1 mg/L
Benzo(a)pyrene	0.0002 mg/L	Total Trihalomethanes (TTHMs)	0.10 mg/L
Carbofuran	0.04 mg/L	Toxaphene	0.003 mg/L
Carbon tetrachloride	0.005 mg/L	2,4,5-TP (Silvex)	0.05 mg/L
Chlordane	0.002 mg/L	1,2,4-Trichlorobenzene	0.07 mg/L
Chlorobenzene	0.1 mg/L	1,1,1-Trichloroethane	0.2 mg/L
2,4-D	0.07 mg/L	1,1,2-Trichloroethane	0.005 mg/L
Dalapon	0.2 mg/L	Trichloroethylene	0.005 mg/L
1,2-Dibrome-3-chloropropane (DBCP)	0.0002 mg/L	Vinyl chloride	0.002 mg/L
o-Dichlorobenzene	0.6 mg/L	Xylenes (total)	10 mg/L
p-Dichlorobenzene	0.075 mg/L	***Radionuclides***	
1,2-Dichloroethane	0.005 mg/L	Beta particles and photon emitters	4 millirems /yr
1,1-Dichloroethylene	0.007 mg/L	Gross alpha particle activity	15 picocuries/ liter (pCi/L)
cis-1,2-Dichloroethylene	0.07 mg/L	Radium 226 and radium 228 (combined)	5 pCi/L
trans-1,2-Dichloroethylene	0.1 mg/L	***Microorganisms***	
Dichloromethane	0.005 mg/L	*Giardia lamblia*	TT8
1-2-Dichloropropane	0.005 mg/L	Heterotropic Plate count	TT8
Di(2-ethylhexyl)adipate	0.4 mg/L	*Legionella*	TT8
Di(2-ethylhexyl)phthalate	0.006 mg/L	*Total Coliforms (including fecal coliform and E. coli)*	5.0%10
Dinoseb	0.007 mg/L	Turbitity	TT8

Table 2. Secondary Drinking Water Standards.

Contaminant	Contaminant level
Aluminum	0.05-0.2 mg/L*
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Flouride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 (threshold odor #)
pH	6.5-8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	0.5 mg/l
* Florida Standard = 0.2mg/L	