Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals

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What are Secondary Standards?

The U.S. Environmental Protection Agency (EPA) has established National Primary Drinking Water Regulations that set mandatory water quality standards for drinking water contaminants. These are enforceable standards called "maximum contaminant levels" or "MCLs", which are established to protect the public against consumption of drinking water contaminants that present a risk to human health. An MCL is the maximum allowable amount of a contaminant in drinking water which is delivered to the consumer .

In addition, EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these "secondary maximum contaminant levels" or "SMCLs." They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at the SMCL.

Why Set Secondary Standards?

Since these contaminants are not health threatening at the SMCL, and public water systems only need test for them on a *voluntary* basis, then why it is necessary to set secondary standards?

EPA believes that if these contaminants are present in your water at levels above these standards, the contaminants may cause the water to appear cloudy or colored, or to taste or smell bad. This may cause a great number of people to stop using water from their public water system even though the water is actually safe to drink.

Secondary standards are set to give public water systems some guidance on removing these chemicals to levels that are below what most people will find to be noticeable.

What problems are caused by *these* contaminants?

There are a wide variety of problems related to secondary contaminants. These problems can be grouped into three categories: *Aesthetic effects* -- undesirable tastes or odors; *Cosmetic effects* -- effects which do not damage the body but are still undesirable; and *Technical effects* -- damage to water equipment or reduced effectiveness of treatment for other contaminants. The secondary MCLs related to each of these effects are given in Table 1.

Aesthetic Effects

Odor and Taste are useful indicators of water quality even though odor-free water is not necessarily safe to drink. Odor is also an indicator of the effectiveness of different kinds of treatment. However, present methods of measuring taste and odor are still fairly subjective and the task of identifying an unacceptable level for each chemical in different waters requires more study. Also, some contaminant odors are noticeable even when present in extremely small amounts. It is usually very expensive and often impossible to identify, much less remove, the odor-producing substance.

- *Standards related to odor and taste:* Chloride, Copper, Foaming Agents, Iron, Manganese pH, Sulfate, Threshold Odor Number (TON), Total Dissolved Solids, Zinc.

Color may be indicative of dissolved organic material, inadequate treatment, high disinfectant demand and the potential for the production of excess amounts of disinfectant by-products. Inorganic contaminants such as metals are also common causes of color. In general, the point of consumer complaint is variable over a range from 5 to 30 color units, though most people find color objectionable over 15 color units. Rapid changes in color levels may provoke more citizen complaints than a relatively high, constant color level.

- *Standards related to color:* Aluminum, Color, Copper, Foaming Agents, Iron, Manganese, Total Dissolved Solids.

Foaming is usually caused by detergents and similar substances when water has been agitated or aerated as in many faucets. An off-taste described as oily, fishy, or perfume-like is commonly associated with foaming. However, these tastes and odors may be due to the breakdown of waste products rather than the detergents themselves.

- *Standards related to foaming:* Foaming Agents.

Cosmetic Effects

Skin discoloration is a cosmetic effect related to silver ingestion. This effect, called argyria, does not impair body function, and has never been found to be caused by drinking water in the United States. A standard has been set, however, because silver is used as an antibacterial agent in many home water treatment devices, and so presents a potential problem which deserves attention.

- *Standard related to this effect:* Silver.

Tooth discoloration and/or pitting is caused by excess fluoride exposures during the formative period prior to eruption of the teeth in children. The secondary standard of 2.0 mg/L is intended as a guideline for an upper boundary level in areas which have high levels of *naturally occurring* fluoride.The level of the SMCL was set based upon a balancing of the beneficial effects of protection from tooth decay and the undesirable effects of excessive exposures leading to discoloration. Information about CDC's recommendations regarding optimal fluoridation levels and the beneficial effects for protection from tooth decay can be found at: http://www.cdc.gov/fluoridation/.

- *Standard related to this effect:* Fluoride.

Technical Effects

Corrosivity, and *staining* related to corrosion, not only affect the aesthetic quality of water, but may also have significant economic implications. Other effects of corrosive water, such as the corrosion of iron and copper, may stain household fixtures, and impart objectionable metallic taste and red or blue-green color to the water supply as well. Corrosion of distribution system pipes can reduce water flow.

- *Standards related to corrosion and staining:* Chloride, Copper, Corrosivity, Iron, Manganese, pH, Total Dissolved Solids, Zinc.

Scaling and *sedimentation* are other processes which have economic impacts. Scale is a mineral deposit which builds up on the insides of hot water pipes, boilers, and heat exchangers, restricting or even blocking water flow. Sediments are loose deposits in the distribution system or home plumbing.

- *Standards related to scale and sediments:* Iron, pH, Total Dissolved Solids, Aluminum.

Table I. Secondary Maximum Contaminant Levels

Contaminant	Secondary MCL	Noticeable Effects above the Secondary MCL
Aluminum	0.05 to 0.2 mg/L*	colored water
Chloride	250 mg/L	salty taste
Color	15 color units	visible tint
Copper	1.0 mg/L	metallic taste; blue-green staining
Corrosivity	Non-corrosive	metallic taste; corroded pipes/ fixtures staining
Fluoride	2.0 mg/L	tooth discoloration
Foaming agents	0.5 mg/L	frothy, cloudy; bitter taste; odor
Iron	0.3 mg/L	rusty color; sediment; metallic taste; reddish or orange staining
Manganese	0.05 mg/L	black to brown color; black staining; bitter metallic taste
Odor	3 TON (threshold odor number)	"rotten-egg", musty or chemical smell
pH	6.5 - 8.5	*low pH:* bitter metallic taste; corrosion *high pH:* slippery feel; soda taste; deposits
Silver	0.1 mg/L	skin discoloration; graying of the white part of the eye
Sulfate	250 mg/L	salty taste
Total Dissolved Solids (TDS)	500 mg/L	hardness; deposits; colored water; staining; salty taste
Zinc	5 mg/L	metallic taste
** mg/L is milligrams of substance per liter of water*		

How can these Problems be Corrected?

Although state health agencies and public water systems often decide to monitor and treat their supplies for secondary contaminants, federal regulations do not require them to do this. Where secondary contaminants are a problem, the types of removal technologies discussed below are corrective actions which the water supplier can take. They are usually effective depending upon the overall nature of the water supply.

Corrosion control is perhaps the single most cost-effective method a system can use to treat for iron, copper and zinc due to the significant benefits in (1) reduction of contaminants at the consumer's tap, (2) cost savings due to extending the useful life of water mains and service lines, (3) energy savings from transporting water more easily through smoother, uncorroded pipes, and (4) reduced water losses through leaking or broken mains or other plumbing. This treatment is used to control the acidity, alkalinity or other water qualities which affect pipes and equipment used to transport water. By controlling these factors, the public water system can reduce the leaching of metals such as copper, iron, and zinc from pipes or fixtures, as well as the color and taste associated with these contaminants. It should be noted that corrosion control is not used to remove metals from contaminated source waters.

Conventional treatments will remove a variety of secondary contaminants. *Coagulation/ flocculation* and *filtration* removes metals like iron, manganese and zinc. *Aeration* removes odors, iron and manganese. *Granular activated carbon* will remove most of the contaminants which cause odors, color, and foaming.

Non-conventional treatments like *distillation, reverse osmosis* and *electrodialysis* are effective for removal of chloride, nitrates, total dissolved solids and other inorganic substances. However, these are fairly expensive technologies and may be impractical for smaller systems.

Non-treatment options include blending water from the principal source with uncontaminated water from an alternative source.

What Can You Do?

If you are concerned about the presence of secondary contaminants in your drinking water supply, here are a few suggestions:

- **FIRST, identify your local public water system**. If you pay a water bill, the name, address, and telephone number of your supplier should be on the bill. If you do not pay a water bill, then contact your landlord, building manager, or the local health department -- they should know.
- **SECOND, contact your local public water system.** Inquire about your supplier's monitoring for secondary contaminants. Ask for the list of secondary contaminants which are being monitored in your water supply. Does the water being delivered to the public meet these SMCLs? If you have not yet received notice from your supplier, ask how you can get a copy of the monitoring results.
- **THIRD, if you receive a public notice from your local public water system** regarding other drinking water standards -- READ IT CAREFULLY -- and follow any instructions closely. If you have questions or concerns, contact the person from the water system who is indicated in the notice. If that person is unavailable, contact either the state drinking water program or your local health department.
- **FOURTH, contact your state drinking water program** if your water supplier is unable to provide the information you need. Ask if your water supplier is consistently in compliance with both primary and secondary drinking water regulations. Request a copy of monitoring results that were submitted to the State by your supplier. Your state drinking water program is usually located in the state capital (or another major city), and is often part of the department of health or environmental regulation. Consult the blue "government pages" of your local phone book for the proper address and phone number, or call the Safe Drinking Water Hotline.
- **FIFTH, support rate increases for your local water supplier,** where necessary, to upgrade your supplier's treatment facilities to meet drinking water standards.
- **FINALLY, if you have a private well** and you think that the well may be near a source of contamination or may have been contaminated -- HAVE YOUR WATER TESTED by a certified laboratory. A list of certified labs is available from your state's laboratory certification officer. A list of the certification officers can be obtained from the Safe Drinking Water Hotline.

For More Information

For more information on secondary contaminants, write or call the EPA. Ask for a list of the primary and secondary contaminants, about monitoring requirements for these, and for a list of the health advisories available for these contaminants.

or call the Safe Drinking Water Hotline
at 1-800-426-4791