



Cooperative Extension System

Health Effects of Drinking Water Contaminants

Water Quality Fact Sheet 2

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Chemical contaminants occur in drinking water supplies throughout the United States, ranging from barely detectable amounts to levels that could possibly threaten human health. Determining the health effects of these contaminants is difficult, especially since researchers are still learning how chemicals react in the body to damage cells and cause illness.

Possible Chronic Health Effects

Toxic doses of chemicals cause either acute or chronic health effects. An acute effect usually follows a large dose of a chemical and occurs almost immediately. Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness and even death.

The levels of chemicals in drinking water, however, are seldom high enough to cause acute health effects. They are more likely to cause chronic health effects—effects that occur long after exposure to small amounts of a chemical. Examples of chronic health effects include

cancer, birth defects, organ damage, disorders of the nervous system, and damage to the immune system.

Evidence relating chronic health effects to specific drinking water contaminants is limited. In the absence of exact scientific information, scientists predict the likely adverse effects of chemicals in drinking water using laboratory animal studies and, when available, human data from clinical reports and epidemiological studies. The possible chronic health effects of the chemicals listed in this fact sheet are conservative estimates, rarely based on documented human health effects.

Setting Standards

In setting standards for drinking water contaminants, regulators estimate the concentration of a contaminant that a person can drink safely over a lifetime. These calculations are based on all available toxicological information and allow a generous safety margin. The following chart lists contaminants currently regulated by U.S.

Environmental Protection Agency (EPA) standards as well as those proposed for EPA regulation by 1989.

The EPA standard for drinking water, the Maximum Contaminant Level (MCL), is the highest amount of a contaminant allowed in drinking water supplied by municipal water systems. The MCL is set as close as possible to the Maximum Contaminant Level Goal (MCLG), which is a preliminary standard set but not enforced by the EPA. MCLG's are health goals based entirely on health effects, but MCL's also take into consideration the feasibility and cost of analysis and treat-

ment of the regulated contaminant. Although often less stringent than the corresponding MCLG, the MCL is set to protect health.

Contaminants are regulated when: they occur in drinking water supplies; they are expected to threaten public health; and they can be detected in drinking water by current laboratory methods. The EPA will continue to set standards for many other drinking water contaminants not listed in this fact sheet which meet these criteria.

Regulated Contaminants^a

Inorganics

Contaminant	Source	Possible chronic health effects
Arsenic	rocks and soil; may contaminate commercial phosphates in fertilizers and laundry detergents; pesticide residues; smelting, glass making, and coal mining.	skin and lung cancer; liver and kidney damage. MCL: 0.05 mg/L MCLG: 0.05 mg/L
Asbestos	corrosion of asbestos-cement pipe in water distribution systems; manufacture of cement products, paper, floor tiles, paint, caulking, textiles and plastics.	lung cancer; gastrointestinal cancer when swallowed fibers exceed 10um. MCL: — MCLG: 7.1 million fibers (>10um long)/liter
Barium	rocks and soil; coal and gas mining; coal burning; diesel fuel combustion and jet fuel; paints, bricks and tiles.	hypertension and heart damage. MCL: 1.0 mg/L MCLG: 1.5 mg/L
Cadmium	rocks, coal, and petroleum; byproduct of mining, smelting, refining and electroplating; discarded batteries, paints, and plastics; corrosion of galvanized pipe; landfills and industrial waste sites; fertilizers and sewage sludge.	kidney damage. MCL: 0.010 mg/L MCLG: 0.005 mg/L
Chromium	rocks and soil; mining sites; chrome plating, cement production; waste incineration; contaminated laundry detergent and bleaches; septic systems.	liver, kidney and lung damage. MCL: 0.05 mg/L MCLG: 0.12 mg/L
Copper	rocks and soil; coal burning; iron and steel production; industrial and sewage treatment plant wastes; corrosion of brass and copper pipes.	anemia; digestive disturbances; liver and kidney damage. MCL: 1.3 mg/L MCLG: 1.3 mg/L

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^a The units of measurement are milligrams per liter (mg/L), micrometers (um) and picoCuries (pCi).

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Inorganics (continued)

Contaminant	Source	Possible chronic health effects
Fluoride	rocks and soil; industrial wastes.	mottling of teeth; bone damage. MCL: 4.0 mg/L MCLG: 4.0 mg/L
Lead	rocks and soil; corrosion of lead pipes and lead-soldered pipe joints; combustion of leaded gasoline; smelter emissions and discarded storage batteries.	brain and nerve damage, especially in children; kidney damage; digestive disturbances; blood disorders; hypertension. MCL: .005 mg/L MCLG: 0 mg/L
Mercury	soil and rocks; mining, smelting, coal burning; electrical equipment and fungicides.	brain and nerve damage; kidney damage; birth defects and skin rash. MCL: 0.002 mg/L MCLG: 0.003 mg/L
Nitrate	soils and mineral deposits; fertilizers, sewage and animal wastes.	Methemoglobinemia in infants. MCL: 10 mg/L nitrate-nitrogen 45 mg/L nitrate MCLG: 10 mg/L nitrate-nitrogen 45 mg/L nitrate
Selenium	soil and shales; coal burning, mining, smelting; manufacture of glass, paints, and drugs; fungicides and feed additives.	growth inhibition; skin discoloration; dental and digestive problems; liver damage and psychological disorders. MCL: 0.01 mg/L MCLG: 0.045 mg/L
Silver	soil, coal, and mineral deposits; ore mining and manufacture of alloys; photographic procedures and jewelry making;	argyria, a permanent blue-gray discoloration of skin, mucous membranes and eyes. MCL: 0.05 mg/L MCLG: —

Organics

Contaminant	Source	Possible chronic health effects
Acrylamide	drinking water treatment residue; well drilling; food production and processing; paper making and textile manufacturing.	cancer and nervous system effects. MCL: — MCLG: 0 mg/L
Alachlor	agricultural herbicide.	cancer; damage to eyes and liver. MCL: — MCLG: 0 mg/L
Aldicarb	agricultural insecticide.	cholinesterase inhibition. MCL: — MCLG: 0.009 mg/L

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Organics (continued)

Contaminant	Source	Possible chronic health effects
Benzene	leaking underground fuel storage tanks; industrial wastes; manufacture of pesticides, detergents and solvents.	leukemia and other cancers; nerve, lung, and kidney damage; blood disorders and reproductive effects. MCL: 0.005 mg/L MCLG: 0 mg/L
Carbofuran	agricultural insecticide.	Cholinesterase inhibition; reproductive and immune system effects. MCL: — MCLG: 0.036 mg/L
Carbon Tetrachloride	chemical disposal sites, contaminated soils, and landfills; aerosol sprays; cleaning agents and coolants; laundry and dry-cleaning operations.	cancer; central nervous system depression; liver and kidney damage. MCL: 0.005mg/L MCLG: 0 mg/L
Chlordane	insecticide; hazardous waste sites.	cancer; nerve and liver effects. MCL: — MCLG: 0 mg/L
2,4-D	agricultural herbicide and aquatic weeds control.	liver and kidney damage; skin irritations and muscle effects. MCL: 0.01 mg/L MCLG: 0.07 mg/L
Dibromochloropropane (DBCP)	soil fumigant.	cancer; kidney and liver damage; infertility. MCL: — MCLG: 0 mg/L
p-Dichlorobenzene	dye and pesticide manufacturing.	liver and kidney damage; blood disorders. MCL: 0.075 mg/L MCLG: 0.075 mg/L
1,2-Dichloroethane	vinyl manufacturing; drycleaning solvent, metal degreasers, and adhesives; gasoline additive.	cancer; central nervous system depression; kidney and liver damage; lung and heart damage. MCL: 0.005 mg/L MCLG: 0 mg/L
1,1-Dichloroethylene	industrial solvent, cleaning and degreasing agent.	central nervous system depression; liver, kidney and heart damage. MCL: 0.007 mg/L MCLG: 0.007 mg/L
cis and trans 1,2-Dichloroethylene	transformed from other chlorinated hydrocarbons in drinking water supplies; industrial cleaning and degreasing agents.	liver and kidney damage. MCL: — MCLG: 0.07 mg/L

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Organics (continued)

Contaminant	Source	Possible chronic health effects
1,2-Dichloropropane	industrial solvent and cleaning agents; dry cleaning fluid components, soil fumigants.	liver and kidney damage. MCL: — MCLG: 0.006 mg/L
Endrin	insecticide and rodenticide.	liver and nervous system effects: birth defects. MCL: 0.0002 mg/L MCLG: —
Epichlorohydrin	resin and rubber product manufacturing; contamination of materials used to process food and treat or store drinking water.	cancer; central nervous system, lung, liver and kidney effects; damage to male reproductive organ. MCL: — MCLG: 0 mg/L
Ethyl benzene	hazardous waste sites and styrene production.	nerve, brain, liver and kidney effects. MCL: — MCLG: 0.68 mg/L
Ethylene dibromide	pesticide and soil fumigants; leaded gasoline additives.	cancer; liver, kidney, nervous system, gastrointestinal, and reproductive effects. MCL: — MCLG: 0 mg/L
Heptachlor/Heptachlor Epoxide	insecticide and hazardous waste sites.	cancer; liver damage and central nervous system effects. MCL: — MCLG: 0 mg/L
Lindane	pesticides.	liver and kidney damage. MCL: 0.004 mg/L MCLG: 0.0002 mg/L
Methoxychlor	insecticides.	nervous system, kidney, and liver effects. MCL: 0.10 mg/L MCLG: 0.34 mg/L
Pentachlorophenol (PCP)	herbicides and insecticides; water contact with PCP-treated wood; industrial waste sites.	liver and kidney damage; nervous system, immune system, and reproductive effects; blood disorders. MCL: — MCLG: 0.22 mg/L
Polychlorinated Biphenyls (PCBs)	hazardous waste sites; disposal and manufacture of electrical transformers, electromagnets, fluorescent lights and plastic.	cancer; liver damage. MCL: — MCLG: 0 mg/L
Styrene	manufacture of plastics, synthetic rubbers, resins, and insulators.	liver damage. MCL: — MCLG: 0.14 mg/L

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Organics (continued)

Contaminant	Source	Possible chronic health effects
Tetrachloroethylene	industrial metal, textile, and dry cleaning solvent.	cancer; liver and kidney damage; central nervous system depression. MCL: pending MCLG: pending
Toluene	paint, oil, resin manufacturing; leaking fuel storage tanks; jet fuel.	central nervous system depression; kidney damage MCL: — MCLG: 2.0 mg/L
Toxaphene	insecticides.	cancer, liver and kidney damage. MCL: 0.005 mg/L MCLG: 0 mg/L
2,4,5-TP (Silvex)	herbicides.	liver and kidney damage. MCL: 0.010 mg/L MCLG: 0.052 mg/L
1,1,1-Trichloroethane	hazardous waste sites; industrial solvent and degreasers; drycleaning solvents.	central nervous system depression; liver and cardiovascular damage. MCL: 0.20 mg/L MCLG: 0.20 mg/L
Trichloroethylene (TCE)	hazardous waste sites; drycleaning solvent; manufacturing of chemicals and drugs.	cancer; nervous system depression and heart effects; liver and kidney damage. MCL: 0.005 mg/L MCLG: 0 mg/L
Total Trihalomethanes	formed when residual chlorine in treated drinking water combines with naturally occurring organic matter.	cancer; heart, lung, kidney and liver damage. MCL: 0.100 mg/L MCLG: —
Vinyl Chloride	manufacturing of plastics and synthetic rubber; corrosion of plastic pipes and soldering.	cancer; central nervous system depression; liver, reproductive, and digestive tract effects; birth defects. MCL: 0.002 mg/L MCLG: 0 mg/L
Xylene	leaking underground fuel storage tanks; manufacturing of chemicals and drugs.	nervous system and reproductive effects. MCL: — MCLG: 0.44 mg/L

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Microbial Pathogens

Contaminant	Source	Possible chronic health effects
Coliform Bacteria (an indicator organism for fecal coliform, streptococcal, and other pathogenic bacteria).	sewage, animal wastes; backflow or improper pipe connections in water systems; improperly sealed or constructed wells.	gastroenteritis, salmonella infection, dysentery, typhoid fever and cholera. MCL: <1/100 ml MCLG: 0 mg/L
<i>Giardia lamblia</i>	sewage and animal wastes.	giardiasis (a gastrointestinal infection causing diarrhea, abdominal cramps, and gas). MCL: — MCLG: 0 mg/L
Viruses	sewage	gastroenteric and other viral diseases; hepatitis. MCL: — MCLG: 0 mg/L

Radioactive Elements

Contaminant	Source	Possible chronic health effects
Gross Alpha Particles	natural decay of uranium in rocks and soil.	cancer; bone and kidney damage. MCL: 15 pCi/L MCLG: —
Radium-226, -228	natural decay of uranium in rocks and soil	bone cancer; bone and kidney damage; birth defects. MCL: 5 pCi/L MCLG: pending
Radon	decay of uranium in soils and rocks.	lung cancer, when released as a gas and inhaled. MCL: pending MCLG: pending
Uranium	soil and rocks	cancer and kidney damage. MCL: pending MCLG: pending

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