Guide to Public Health Goals (PHGs) for Chemicals in Drinking Water

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
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This guide explains how Public Health Goals (PHGs) developed by the Office of Environmental Health Hazard Assessment (OEHHA) help to maintain the quality of California's drinking water supplies.

Contaminants in Drinking Water

California's regulatory drinking water standards protect the public from harmful substances, but no water supply is ever completely free of contaminants. Some, such as arsenic and uranium, can occur naturally. Others, such as fuels, industrial solvents, pesticides and metals, may enter water supplies from chemical spills and leaking tanks and pipelines, or they may be a legacy of agricultural and waste-disposal practices that predated modern environmental laws.

It is natural for people to want their drinking water to be completely free of all contaminants. However, preventing or removing all contamination often is not economically or technologically feasible. State health authorities are responsible for determining the levels of contaminants that, based on current laws and recommendations, can remain in water supplies without threatening human health.

Public Health Goals and Drinking Water Standards

To keep drinking water safe, the California Legislature passed the Calderon-Sher Safe Drinking Water Act of 1996. This law requires the Department of Health Services (DHS) to regularly test drinking water supplies and set standards for contaminants in the water. The Act also requires OEHHA to develop Public Health Goals (PHGs) for contaminants in California's publicly supplied drinking water.

PHGs Set at Levels That Protect Human Health

For carcinogens, OEHHA establishes the PHG at the "one-in-one-million" risk level. At that level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical.

For chemicals that cause health effects other than cancer, OEHHA sets the PHG at a level that is not expected to cause any toxic effects, including birth defects and chronic illness.

What Is a Public Health Goal?

A PHG is the level of a chemical contaminant in drinking water that does not pose a significant risk to health. PHGs are not regulatory standards; however, state law requires DHS to set drinking water standards for chemical contaminants as close to the corresponding PHG as is economically and technically feasible.

In some cases, it may not be feasible for DHS to set the drinking water standard for a contaminant at the same level as the PHG. The technology to treat the chemicals may not be available, or the cost of treatment may be very high. DHS must consider these factors when developing a drinking water standard.

How Does OEHHA Establish a Public Health Goal?

The process for establishing a PHG for a chemical contaminant in drinking water is very rigorous. OEHHA scientists first compile all relevant scientific information available, which includes studies of the chemical's effect on laboratory animals and studies of humans who have been exposed to the chemical. The scientists use data from these studies to perform a *health*

risk assessment, in which they determine the levels of the contaminant in drinking water that could be associated with various adverse health effects. (For more information on health risk assessments, please see "A Guide to Health Risk Assessment," on OEHHA's Web site at www.oehha.ca.gov.) In performing the health risk assessment, OEHHA considers the following factors:

- Certain groups of people, such as pregnant women, young children, the elderly or persons with pre-existing illnesses, who may be especially susceptible to the chemical's adverse effects. The PHG must consider health effects on individuals in these groups.
- Accumulated effects of exposure to the chemical from other sources, such as food, air and soil, and other uses of drinking water, such as showering.
- The chemical's potential to interfere with bodily functions in a way that increases the risk of chronic health problems, such as liver damage.
- Possible synergistic effects from the combined exposure to the chemical in question and other chemicals, which may further increase health risks.

When calculating a PHG, OEHHA uses all the information it has compiled to identify the level of the chemical in drinking water that would not cause significant adverse health effects in people who drink that water every day for 70 years. OEHHA assumes that an adult will drink two liters of water per day and a child will drink one liter per day. OEHHA must also consider any evidence of immediate and severe health effects when setting the PHG.

OEHHA establishes the PHG at a level that provides protection against any known cancer and "noncancer" health effects associated with exposure to the chemical in question. For cancer-causing chemicals, OEHHA typically establishes the PHG at the "one-in-one million" risk level. At that level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical. The "one-in-one million" risk level is widely accepted in the medical and scientific communities as the "negligible risk" standard.

For chemicals that do not cause cancer, OEHHA sets the PHG at a level that is not expected to cause any toxic effects, including birth defects and chronic illness. OEHHA reviews scientific studies of a chemical and identifies the lowest level of exposure to the chemical that caused no observed health effects in those studies. OEHHA then adds a "safety margin" to account for uncertainties and gaps in information on the chemical's toxicity. The PHG is commonly set at 100 to 3,000 times below the "no observable effect level," depending on the type of toxicity associated with the chemical, and the amount of scientific information available. OEHHA assumes people will drink the water daily for many years

OEHHA's Role in Protecting Water Quality

OEHHA is part of the California Environmental Protection Agency. Its professional staff includes toxicologists, epidemiologists, physicians, biostatisticians, and research scientists who are located in offices in Sacramento and Oakland. OEHHA is responsible for assessing health risks posed to the public by hazardous chemicals and provides its scientific expertise in this area to other state regulatory agencies. Through its risk assessments and its development of Public Health Goals (PHGs), OEHHA assists the Department of Health Services in developing regulatory standards for chemicals in the state's drinking water.

when developing a PHG to protect against noncancer health effects. This assumption of lifelong exposure to a contaminant is a standard practice in risk assessment.

Many drinking water contaminants are associated with both cancer and noncancer health effects. In those cases, OEHHA will determine the two levels that adequately protect against cancer and noncancer health effects, and then set the PHG at the lower of the two levels. This helps ensure the PHG is set at a health-protective level.

Who Keeps Drinking Water Safe?

U.S. Environmental Protection Agency (U.S. EPA) sets national drinking water standards and grants authority to each state to administer its own drinking water program.

California Department of Health Services (DHS) is the regulatory agency with the authority to set and enforce drinking water standards for the state. It may maintain standards at levels set by U.S. EPA, or it may set more stringent standards. Through its Drinking Water Program, the department works with **county health departments** to license and monitor public water systems and set standards for privately owned wells.

California Environmental Protection Agency (Cal/EPA) includes the **Office of Environmental Health Hazard Assessment**, the **State Water Resources Control Board** and nine **Regional Water Quality Control Boards**. The water boards evaluate the quality of the state's surface water and groundwater, and regulate the storage and discharge of materials and pollutants that affect water quality. OEHHA develops Public Health Goals for drinking water.

Local governments may oversee commercial, private or agricultural use of land affecting water quality.

Public water systems have the ultimate responsibility for keeping water safe. Any system that serves more than 25 people or 15 service connections must regularly test its water supplies and meet state and federal regulatory standards.

After developing a draft PHG, OEHHA posts the document on its Web site (www.oehha.ca.gov/water/phg/index.html) and holds a public-review period and at least one public workshop to solicit comments from interested parties. The draft document is also reviewed by one or more independent scientists from the University of California or another academic institution, as well as the U.S. Environmental Protection Agency. OEHHA considers these comments before determining the final PHG.

Final PHG documents are posted on OEHHA's Web site. OEHHA is mandated by law to review a published PHG at least every five years and revise it, as necessary, based on any new scientific data. OEHHA maintains an updated list of PHGs on its Web site at (www.oehha.ca.gov/water/phg/allphgs.html).

How Are Public Health Goals Used to Set Regulatory Standards for Chemicals in Drinking Water?

PHGs are necessary guides for making decisions about the levels of chemical contaminants in drinking water, but these guidance levels are just one element that DHS must consider when maintaining the quality of drinking water. By law, DHS must set the state's regulatory standards, known as *Primary Maximum Contaminant Levels* (MCLs), as close as possible to the PHG levels that OEHHA establishes. However, DHS must also consider the cost and technical feasibility of treating or preventing chemical contamination.

The Calderon-Sher Safe Drinking Water Act requires OEHHA to develop a PHG for each drinking water contaminant that is regulated with an MCL. OEHHA must also develop a

PHG before DHS can establish an MCL for a contaminant for the first time. DHS must review a primary MCL at least every five years and amend it, if necessary, to make it as close to the corresponding PHG as is feasible. DHS could amend an MCL if the PHG evaluation indicates that the contaminant is more or less toxic than was previously believed, or if new technology is available to reduce concentrations to levels closer to the PHG.

Is Water Safe to Drink if Contaminant Levels Exceed Public Health Goals?

As long as drinking water complies with all MCLs, it is considered safe to drink, even if some contaminants exceed PHG levels. A PHG represents a health-protective level for a contaminant that DHS and California's public water systems should strive to achieve *if* it is feasible to do so. However, a PHG is *not* a boundary line between a "safe" and "dangerous" level of a contaminant, and drinking water can still be considered acceptable for public consumption even if it contains contaminants at levels exceeding the PHG.

For example, suppose the actual level of a contaminant in many drinking water sources were high enough to pose a "ten-in-one million" cancer risk. (At that level, not more than ten cancer cases would be expected in a population of one million people as a result of drinking water containing that level of the contaminant daily for 70 years.) As explained on page 3, OEHHA typically establishes the PHG for cancer-causing contaminants at the "one-in-one million" risk level. However, a "ten-in-one million" risk is widely considered by health and scientific authorities to be acceptable as long as it is not feasible to further reduce the risk. State law would allow DHS to set the MCL for the contaminant at the level posing a "ten–in-one million" risk of cancer if it were not feasible to set the standard at a lower level. In this case, levels of the chemical exceeding the PHG and below the MCL would be considered acceptable for protection of public health.

Even if a PHG is not immediately achievable, it still represents an important long-term goal for California drinking water. The PHG helps give researchers an incentive to develop new or improved cost-effective water-treatment technologies that can feasibly reduce contaminants to PHG levels.

How Can the Public Learn More About Contaminants in the Water?

California law requires that public water systems inform consumers about the quality of their drinking water through the following reports:

Annual Consumer Confidence Reports

Public water systems are required to send each customer an annual consumer confidence report that describes the source of the water supply and any contaminants detected in it. The report must list the current level of a contaminant as well as its PHG and primary MCL. The report must also disclose if an MCL was exceeded and include a plainly worded statement of associated health concerns.

Exceedance Reports

Water systems with more than 10,000 service connections by law must prepare an exceedance report every three years if one or more chemical contaminants exceed PHG levels. The report provides information on health risks posed by the contaminants as well as the costs and technology needed to reduce the contaminants to the PHG level. The report must also explain

what action, if any, the local water supplier has planned to address the contamination. The water supplier must hold a public hearing on the report.

Other Notification Requirements

When a contaminant in a public drinking water source exceeds the primary MCL, the water supplier must notify its customers in accordance with DHS requirements. In instances where there is an imminent threat to human health, the water supplier would have to provide immediate notice to customers. The law requires DHS to approve the content of such notices.

Sources of Additional Information

Office of Environmental Health Hazard Assessment
OEHHA's Web site (www.oehha.ca.gov) contains draft and final PHG documents, announcements of public workshops and comment periods on draft PHGs, copies of this fact sheet, and other fact sheets concerning health risk assessment, diesel exhaust, children's health and other topics. For more information, contact:

Office of Environmental Health Hazard Assessment
Pesticide and Environmental Toxicology Section
1001 I Street, P.O. Box 410
Sacramento, California 95812
(916) 324-7572

California Department of Health Services
The DHS Division of Drinking Water and Environmental Management posts information on PHGs and MCLs on its Web site. Contact:

Division of Drinking Water and Environmental Management
Department of Health Services
P.O. Box 942732
Sacramento, California 94234-7320
(916) 322-2308
www.dhs.ca.gov

Local Public Water System, County Health Department or County Environmental Health Department
The best source of information on contaminants in your local drinking water supply is usually the local water supplier. For contact information, check your water bill or call your city's public works department. If your source of drinking water is a private well, contact your county health or environmental health department for water quality standards and testing information.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see California's official "Flex Your Power" Web site at www.flexyourpower.ca.gov.