

LESSON: Consider the Source

Summary: Students learn how to critically analyze information sources by comparing and contrasting the *EHP Student Edition* article “NAS Reports on Perchlorate Safety” and two press releases (one from the Council on Water Quality, the other from the California Environmental Protection Agency [EPA]) about California’s public health goal (PHG) for perchlorate.

EHP Article: “NAS Reports on Perchlorate Safety”
EHP Student Edition, October 2005, p. A449
<http://ehp.niehs.nih.gov/docs/2005/113-7/forum.html#nasr>

Objectives: By the end of this lesson, students should be able to:

1. differentiate between an enforceable drinking water standard and an unenforceable drinking water equivalent, public health goal, or reference dose;
2. describe the roles of science and politics in setting limits for the presence of certain chemicals in drinking water; and
3. apply critical thinking to analyze sources of information for potential bias.

Class Time: 1.5 hours if Step 3 is assigned as homework; 3 hours if the entire lesson is done in class

Grade Level: 10–12

Subjects Addressed: Biology, Environmental Science, General Science, Health, Integrated (Social Studies, Language Arts)

Prepping the Lesson (15–20 minutes)

INSTRUCTIONS:

1. Obtain a class set of *EHP Student Edition*, October 2005, or download the article “NAS Reports on Perchlorate Safety” at <http://ehp.niehs.nih.gov/docs/2005/113-7/forum.html#nasr>.
2. Make copies of the Student Instructions, including the Council on Water Quality and California EPA press releases.
3. Review the article, Background Information section for this lesson, and Implementing the Lesson instructions.

MATERIALS (per student):

- 1 copy of *EHP Student Edition*, October 2005, or 1 copy of “NAS Reports on Perchlorate Safety”
- 1 copy of Student Instructions including the Council on Water Quality and California EPA press releases

VOCABULARY:

- bias
- drinking water equivalent
- drinking water standard
- maximum contaminant level (MCL)
- national primary drinking water regulations (NPDWR)
- perchlorate
- public health goal
- reference dose



BACKGROUND INFORMATION:

As you read this section, the *EHP Student Edition* article, and other documents associated with this topic you will encounter several terms that are seemingly interchangeable but that have subtle differences in their meaning. Those terms are defined for you below. You may need to review these with the students.

Drinking water equivalent level (DWEL)—An estimated exposure (in mg/L) for chemicals that may be carcinogenic but for which carcinogenicity has not been completely established. The DWEL is thought to be protective for the noncarcinogenic end points of toxicity (i.e., protective against toxic effects of the chemical other than cancer). A DWEL is used for these types of chemicals to evaluate noncancer end points, but infers that carcinogenicity should be considered the toxic effect of greatest concern. DWELs are not legally enforceable standards.

Maximum contaminant level (MCL)—The maximum allowable level of a contaminant in a public drinking water supply. The MCL works in conjunction with the national primary drinking water regulations (NPDWRs). NPDWRs are legally enforceable standards that protect public health by limiting the levels of contaminants in drinking water.

National primary drinking water regulations (NPDWRs, or primary standards)—legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

Public health goal (PHG)—The level of a contaminant in drinking water that has no known or expected risk to health. PHG is a term used by the California EPA.

Reference dose (RfD)—A scientific estimate of the total daily exposure from drinking, eating, breathing, or absorbing a chemical. The RfD is not expected to cause adverse health effects in humans. The RfD is often given in dose units of amount of chemical per body weight (mg/kg). The RfD is not a legally enforceable standard.

Perchlorate is a primarily man-made anion found as a salt of ammonium, potassium, or sodium. It is mostly used in explosives and solid rocket propellants. A July 2005 *EHP Student Edition* article titled “Perchlorate Exposure: Tip of the Iceberg?” describes research showing the pervasive presence of perchlorate in cow’s milk, lettuce, other fruits and vegetables, and river water. Perchlorate is known to inhibit the transport of iodide into the thyroid. What is not known is the effect of long-term chronic exposure to perchlorate, especially to fetuses and infants. The concern is that thyroid hormone reduction may cause birth defects, including effects on brain development and IQ reduction, and may possibly promote thyroid tumors. As more testing on food and water is done, it appears that perchlorate contamination may be extensive in parts of the United States, and the potential cost of cleaning it up would be huge. The perchlorate debate primarily revolves around two key issues: 1) setting an enforceable drinking water standard and 2) determining the standard level which is “safe” for human consumption given the total potential body burden from multiple exposures like water and food.

The *EHP Student Edition* article “NAS Reports on Perchlorate Safety” discusses the publication of a report by the National Academy of Sciences (NAS) called *Health Implications of Perchlorate Ingestion* (<http://www.nap.edu/books/0309095689/html/>). This report provides a reference dose (RfD) for a maximum daily intake of perchlorate for humans of 0.0007 mg/kg from all sources.

In 2002 the U.S. EPA set the DWEL for perchlorate in water at 1 part per billion (ppb), a decrease from the previous recommendation of 18 ppb. In 2005 the U.S. EPA took the daily RfD recommended by the NAS and revised its groundwater DWEL from 1 ppb up to 24.5 ppb.

Many states are reviewing the data independently to derive their own RfD and corresponding DWEL for perchlorate. States can also develop their own state-level enforceable standard (called a public health goal, or PHG, in California), which is typically done after a DWEL is established. In 2002, California set its PHG for perchlorate in water at 4 ppb (the lowest detectable limit at the time). California then increased its PHG to 6 ppb based on its interpretation of health effects data.

Interpretation of health data depends on many factors, some of which can be subjective, including opinions as to the applicability of rat and mouse experiments to humans, the quality of a human epidemiologic study, and the interpretation of biological sequences related to the manifestation of health effects. Interpretation of health data also typically considers the source of the data, including the history of reliability of the source or whether a source may be potentially biased.

Ideally, science operates in an unbiased, skeptical, and thorough manner. This means individual scientists would design high-quality research with minimal errors and enough repetitions or subjects to make the study statistically valid. When interpreting the data, a good scientist is careful not to overstate conclusions the data do not support and to be skeptical of their results by asking critical, analytical questions.



Because scientists are human, error and bias will likely occur. In an attempt to overcome error and bias to seek the “true answers” related to what is being studied, many scientists work in the same field of research, repeat each other’s experiments, criticize each other’s work, and build from each other’s results. Typically conclusions are not reached about a question being studied (such as “does perchlorate cause birth defects by interfering with thyroid hormone production?”) until many studies demonstrate similar results. The studies would often be a mix of human epidemiology, controlled laboratory studies on mice and rats, and cell line studies.

Most science occurs in this checks-and-balances fashion—everyone does their best, but admits to error and potential bias, and the research community relies on the network of scientists to “keep each other honest.” Unfortunately, not all “science” works this way. People can be biased by their employer or by a special interest group from whom they receive money.

Scientists receive money to do their research from several possible sources. Most research funding in the United States comes from agencies within the U.S. government, such as the Centers for Disease Control and Prevention or the National Institute of Environmental Health Sciences. Sometimes scientist receive research funding directly from the college or university where they work. In most cases, money received from government agencies or institutes of higher education comes “unencumbered,” meaning scientists can freely investigate what they want and how they want, as long as the research plan is sound.

For-profit companies also provide money for research, but it is generally for very specific purposes. In some cases the research results may be almost “dictated.” The experiment is designed to find the benefits or to not find any negative or adverse affects. This would be considered biased research. This is why it is important for scientists to reveal their funding sources.

RESOURCES:

California Department of Health, “Perchlorate in California Drinking Water: Overview and Links,”

<http://www.dhs.ca.gov/ps/ddwem/chemicals/perchl/perchlindex.htm>

Capps letter to President Bush: Lift the Gag Order on Perchlorate,

http://www.house.gov/apps/list/press/ca23_capps/pr030527perchlorategag.html

Companies affiliated with the Council on Water Quality’s press release: Aerojet, <http://www.aerojet.com/default.cfm>, American Pacific

Corporation, <http://www.apfc.com/>, Kerr-McGee Chemical, <http://www.kerr-mcgee.com/>, Lockheed Martin, <http://www.lockheedmartin.com/>

“Contaminant Focus: Perchlorate,” U.S. EPA, <http://clu.in.org/contaminantfocus/default.focus/sec/perchlorate/cat/Overview/>

Definitions of common water quality terms, <http://www.ccwater.com/waterquality/defin.asp>

Drinking water glossary, U.S. EPA, <http://www.epa.gov/safewater/pubs/gloss2.html>

Environmental Working Group, Rocket Fuel Contamination in California Milk, <http://www.ewg.org/reports/rocketmilk/>

James Strock: Biography, U.S. EPA, <http://www.epa.gov/history/admin/oeca/strock.htm>

“Lettuce Explore Perchlorate in Food,” *EHP Student Edition* lesson, July 2005, <http://ehp.niehs.nih.gov/science-ed/>

List of drinking water contaminants and MCLs, U.S. EPA, <http://www.epa.gov/safewater/mcl.html>

Massachusetts.gov, perchlorate information, including health effects toxicological profile and assessment,

<http://www.mass.gov/dep/brp/dws/percinfo.htm>

The National Academies: News, “Report Assesses Health Implications for Perchlorate Exposure,”

<http://www4.nationalacademies.org/news.nsf/isbn/0309095689?OpenDocument>

National Academy of Sciences, *Health Implications of Perchlorate Ingestion*, <http://www.nap.edu/books/0309095689/html/>

Perchlorate, U.S. EPA, <http://www.epa.gov/fedfac/documents/perchlorate.htm>

“Perchlorate Exposure: Tip of the Iceberg?,” *EHP Student Edition*, July 2005, p. A232, <http://ehp.niehs.nih.gov/docs/2005/113-4/forum.html#perc>

Perchlorate questions and answers, U.S. EPA <http://www.cfsan.fda.gov/~dms/clo4qa.html>

“Potassium perchlorate, potassium iodide, and propylthiouracil: promoting effect on the development of thyroid tumors in rats treated with N-bis(2-hydroxypropyl)-nitrosamine,” *Japanese Journal of Cancer Research* 78(12):1335–1340 (1987),

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2828294&dopt=Citation

“Reference Dose for Perchlorate Based on Human Studies,” U.S. EPA, <http://www.epa.gov/ncea/perchlorate/comments/documents/ddoc014.pdf>

Setting standards for safe drinking water, U.S. EPA, <http://www.epa.gov/safewater/standard/setting.html>



Implementing the Lesson

INSTRUCTIONS:

1. Hand out a copy of “NAS Reports on Perchlorate Safety” and the Student Instructions. Inform the students that they are going to learn more about the scientific process, the political issues surrounding drinking water levels for perchlorate, and how to review information for potential bias. Then instruct the students to read the article (Step 1).
2. When students are done reading, inform them that regulating perchlorate contamination in water is a hotly contested and politically charged issue. Clarify these points for the students:
 - An enforceable law for drinking water is called a “drinking water standard.”
 - Right now the United States and most states do not have drinking water standards for perchlorate. Instead they have an unenforceable guideline in place called a “drinking water equivalent level” (DWEL). The DWEL is often used as a guideline to eventually set an enforceable standard.
 - Setting drinking water standards can be a complex and politically charged process. The first step in the process is to review as much of the scientific research on the health effects of the chemical as possible. Typically all or most of the available studies are considered. This includes rat, mouse, cell, and human studies. The goal is to see if there are consistent results across the studies for certain exposures to the chemical. Once a no-observable-effect level (NOEL) is believed to have been identified, then a safety factor is built in to account for things like daily, repeated, long-term exposures. The factor can range from 10 to 1,000 times less than the NOEL. The article “NAS Reports on Perchlorate Safety” mentioned that the Greer study found a NOEL for perchlorate of 0.007 mg/kg of body weight. The NAS took that number and applied a “10-fold” uncertainty factor, recommending a reference dose of 0.0007 mg/kg.
 - Politics enters into the standard-setting process in a couple of places. The initial research review can be biased or purposefully incomplete, with reviewers selecting studies that only seem to support the desired end result (i.e., a lower or higher standard). Once a standard is proposed, special interest groups often lobby politicians or regulators, or go to court in an attempt to raise or lower the proposed standard.
3. After the students have completed Step 2, review the answers and elaborate as needed for students to be able to complete Step 3. For Step 3 students should produce a high-quality 1- to 2-page essay. Let the students know whether they will need to write their essay as homework. Students’ writing and critical thinking skills will be best developed if they are given the opportunity to write several revised drafts that have your and/or peer-reviewed feedback.
4. Below are some points you may want to share with students at the appropriate time.
 - It is important for students to understand that public policy is a tug-of-war between many special interests. Those special interests may try to manipulate the perceptions of the public to attain their goal.
 - Students should be aware that high-level appointments in the California and U.S. EPA are political appointments.
 - Although scientific data are often an important part of the discussion for policy, they are not always appropriately considered or included in the decision-making process. However, it is critical to have the scientific data available. Otherwise, decisions will be based on nothing but opinion and emotion (which is totally subjective and generally biased).
5. Ask the students to discuss the following issues:
 - Issues of accuracy, timing, and interpretation of many of the same data by the NAS, U.S. EPA, California EPA, and the state of Massachusetts.
 - What purpose(s) did the press releases serve? (Answers may vary but could include the opportunity to advance a specific perchlorate agenda, reinforce or show support for a decision, attack or degrade another position, confuse the public, etc.)
 - What were the approaches of the *EHP Student Edition* article, the Council on Water Quality press release, and the California EPA press release? Did any show an obvious attempt to get the reader to support one side or the other?
 - Discuss the use of specific information in the *EHP Student Edition* article and the press releases. Were specific facts and citations utilized to support points, or were broad unsupported statements made?
 - Did the *EHP Student Edition* article and the press releases present one or more sides of the issue?
 - What was the “feel” of the *EHP Student Edition* article? Of each of the press releases?
 - Ask the students if they are convinced one way or the other about the 24 ppb EPA DWEL versus the 6 ppb California PGH. Have them describe what exactly convinced them and why.



NOTES & HELPFUL HINTS:

- Students may need to access the Internet to learn more about perchlorate and its health effects, *EHP*, the companies affiliated with the Council on Water Quality (Aerojet, American Pacific Corporation, Kerr-McGee Chemical, Lockheed Martin), or the California EPA. You can provide them with additional information if needed.
- This lesson could be extended by having the students do research on the process of creating an enforceable water quality standard.

Aligning with Standards

SKILLS USED OR DEVELOPED:

- Communication (notetaking, oral, written—including summarization)
- Comprehension (listening and reading)
- Critical thinking and response
- Research

SPECIFIC CONTENT ADDRESSED:

- health
- environmental health
- environmental science
- perchlorate
- risk
- sources of information
- politics
- water quality standards
- reference dose
- drinking water equivalent
- maximum contaminant level

NATIONAL SCIENCE EDUCATION STANDARDS MET:**Unifying Concepts and Processes Standard**

- Systems, order, and organization
- Evidence, models, and explanation

Science As Inquiry Standard

- Understanding about scientific inquiry

Science in Personal and Social Perspectives Standards

- Personal and community health
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

History and Nature of Science Standards

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

Assessing the Lesson

Step 2: See table on next page.



Question	<i>EHP Student Edition Article</i>	Press release from the Council on Water Quality	Press release from the California EPA
Who is the author and what are the author's credentials?	Richard Dahl, credentials unknown, is a writer for the magazine <i>Environmental Health Perspectives</i>	James Strock, former secretary of the California EPA, former chief law enforcement officer of the U.S. EPA. His specific training is not included in the press release. Additional Internet research reveals that James Strock is an attorney.	Specific author information is not listed but could be Alan Hirsch or the Office of Environmental Health Hazard Assessment (OEHHA) director Joan E. Denton. Hirsch's credentials are unknown from this document. Denton directs one of the California EPA's divisions and holds either an MD or PhD in an unknown field. Additional Internet research reveals that Denton's PhD is in biology and Hirsch is the deputy director of the OEHHA division with a background in communications.
Does the article/press release present one side or both sides of the issue? Explain.	Both sides of the issue are presented. Opinions supporting and criticizing the Greer study and the NAS recommendations are included.	Only one side of the issue is presented. The press release is critical of the California EPA PHG without providing statements on behalf of the California EPA.	Mostly one-sided. The California EPA is defending its decision to keep the PHG for perchlorate of 6 ppb. It does not mention the U.S. EPA's decision of 24 ppb using the same NAS document.
Are there any examples of persuasive language or statements of opinion in the article or press release? List.	None	<ol style="list-style-type: none"> 1. "It is unfortunate the Cal/EPA announcement ..." 2. "most disappointing is that the state..." 	<ol style="list-style-type: none"> 1. "In light of the favorable NAS findings..." 2. "...provides strong support for the approach that we took..." 3. "...reinforces the solid scientific foundation that underlies California's efforts..." 4. "The NAS specifically recommended the use of a well-regarded 2002 study..."
What is the agency or group affiliated with the article or press release? Are there any known or identified business interests associated with the group?	The National Institute of Environmental Health Science (NIEHS). No special interest groups are identified.	The Council on Water Quality Perchlorate Study Group has industry producers and users of perchlorate as its members. These include Aerojet, American Pacific Corporation, Kerr-McGee Chemical, and Lockheed Martin.	The California EPA. No special interest groups are identified.
What benefit might each sponsoring group or agency get from their presentation of the information?	An educated public that is informed about health issues, the federal decision-making process, and other factors that may come into play in that process. The benefit to the agency is having the public see value in its tax dollars funding this agency and then expressing either support for its continuation or their opinion to politicians about environmental health issues.	The press release makes people question the legitimacy of the California EPA PHG for perchlorate. The intention may be to get a reporter to pick up the press release and approach an article with the perspective presented in that release. The benefit to having people support the new EPA DWEL is it makes it appear that public health is being protected, without any legal enforcement. Because the companies affiliated with the Council on Water Quality use or create perchlorate-based fuels, it is in their best interest to not have an enforceable standard or to keep water regulations for perchlorate as high as possible. This limits their liability and financial requirements for any cleanup associated with the creation or use of this product. Also, a standard based on the DWEL 24 ppb is less costly to meet for cleanup compared to California's 6 ppb.	Benefit would be similar to that described for the NIEHS. Protecting public health might also save state tax dollars. The California EPA's Office of Environmental Health Hazard Assessment (OEHHA) says its mission is "to protect and enhance public health and the environment by objective scientific evaluation of risks posed by hazardous substances."



Step 3: Student answers will vary. Check for accuracy, use of detail, demonstration of understanding, quality of explanations, grammar, and writing flow and sequence. Provide students with several opportunities for review with revision, as this helps students develop writing and critical thinking skills.

Authors and Reviewers

Author: Stefani Hines, University of New Mexico

Reviewers: Susan Booker, Liam O'Fallon, Lisa Pitman, Wendy Stephan, Kimberly Thigpen Tart



Step 1: Read the article "NAS Reports on Perchlorate Safety," *EHP Student Edition*, October 2005, p. A449, and the press releases from the Council on Water Quality and the California Environmental Protection Agency (EPA).

Step 2: Science plays an important role in our world, from the development of new technology to the discovery of how our solar system formed. In the health field, science can save many lives or prevent illness. Ideally, appropriate decisions are made based on sound scientific discoveries, but this is not always the case. Personal or political agendas become involved in the decision-making process. These agendas can be motivated by profit, power, or the advancement of personal opinion.

Sometimes personal or political agendas have little or no effect on the average person, so these may be considered "harmless." However, there are other agendas that may result in harm to millions of people and negatively affect the quality of their lives or health.

How can the average person tell if an issue is being "politicized" for the benefit of a particular group or if the issue is putting the general population at risk? It requires asking questions and doing the research to answer them.

Using the *EHP Student Edition* article and the two press releases, answer the questions in the table on the next page.

Question	<i>EHP Student Edition</i> Article	Press release from the Council on Water Quality	Press release from the California EPA
Who is the author and what are the author's credentials?			
Does the article/press release present one side or both sides of the issue? Explain.			
Are there any examples of persuasive language or statements of opinion in the article or press release? List.			
What is the agency or group affiliated with the article or press release? Are there any known or identified business interests associated with the group?			
What benefit might each sponsoring group or agency get from their presentation of the information?			



Step 3: Now you have learned a bit more about the politics of perchlorate. Consider this new information with the information provided in the *EHP Student Edition* article and the press releases from the Council on Water Quality and the California EPA as you answer the following question: If you were asked to set an enforceable drinking water standard for perchlorate, would you use the Massachusetts drinking water equivalent of 1 ppb, the California drinking water equivalent of 6 ppb, or the new U.S. EPA drinking water equivalent of 24 ppb? What additional information might you need to make a decision?

Write a clear, thorough, logical 1- to 2-page essay and justify your reasoning with facts and supporting documents. Do additional research on the subject as needed.

Below are some points you may want to consider in your essay.

- Although drinking water equivalent levels (DWELs) are not enforceable, they are often used to set enforceable drinking water standards. Once a standard is established, companies that create pollution above the EPA allowable levels are required to clean it up using their own funds.
- In 2002 the U.S. EPA's risk assessment for perchlorate resulted in a proposed drinking water equivalent of 1 ppb of perchlorate (compared to the current U.S. EPA equivalent of 24.5 ppb). The 2002 health reference was based on several human and rat studies. Some of the rat studies showed an increase of thyroid tumors with perchlorate exposure, and there is evidence of birth defects from perchlorate exposure.
- The July 2005 *EHP Student Edition* article "Perchlorate Exposure: Tip of the Iceberg?" states that 90% of lettuce samples from five states contained an average of 7.76–11.9 ppb, with the highest concentration being 71.6 ppb. Researchers also found an average of 5.76 ppb of perchlorate present in 97% of the milk samples taken. It is believed the source of the perchlorate in food is primarily from contaminated drinking water used for irrigation. Drinking water standards must consider exposures from multiple sources.

Below are some definitions that you will find useful:

- **Drinking water equivalent level (DWEL)**—An estimated exposure (in mg/L) for chemicals that may be carcinogenic but for which carcinogenicity has not been completely established. The DWEL is thought to be protective for the noncarcinogenic end points of toxicity (i.e., protective against toxic effects of the chemical other than cancer). A DWEL is used for these types of chemicals to evaluate noncancer end points, but infers that carcinogenicity should be considered the toxic effect of greatest concern. DWELs are not legally enforceable standards.
- **Maximum contaminant level (MCL)**—The maximum allowable level of a contaminant in a public drinking water supply. The MCL works in conjunction with the national primary drinking water regulations (NPDWRs). NPDWRs are legally enforceable standards that protect public health by limiting the levels of contaminants in drinking water.
- **National primary drinking water regulations (NPDWRs, or primary standards)**—legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.
- **Public health goal (PHG)**—The level of a contaminant in drinking water that has no known or expected risk to health. PHG is a term used by the California EPA.
- **Reference dose (RfD)**—A scientific estimate of the total daily exposure from drinking, eating, breathing, or absorbing a chemical. The RfD is not expected to cause adverse health effects in humans. The RfD is often given in dose units of amount of chemical per body weight (mg/kg). The RfD is not a legally enforceable standard.



**FOR IMMEDIATE RELEASE**

April 1, 2005

For More Information:

Council on Water Quality

News Bureau: 916-448-3152

www.councilonwaterquality.org

James Strock, former Secretary of the California Environmental Protection Agency (Cal/EPA) and former chief law enforcement officer of the U.S. Environmental Protection Agency (U.S. EPA), issued the following statement regarding today's press release from Cal/EPA announcing California's Public Health Goal (PHG):

**CALIFORNIA PHG FOR PERCHLORATE DIVERGES FROM NATIONAL ACADEMY OF SCIENCE RECOMMENDATIONS;
STATE SHOWS NO ADDITIONAL HEALTH BENEFITS IN LOWER
HEALTH GOAL NUMBER**

It's unfortunate the Cal/EPA announcement of a PIIG of 6 parts per billion (ppb) for perchlorate does not fully reflect the conclusions of an expert panel on perchlorate convened by the National Academy of Sciences (NAS). Most disappointing is that the state, in moving in a direction different from the NAS findings, has demonstrated no additional public health benefits.

NAS recommended a reference dose of 0.0007 milligrams per kilogram of perchlorate per day, which the U.S. EPA subsequently translated into a Drinking Water Equivalent Level (DWEL) of 24.5 ppb.

NAS explained their conclusions were based on a highly conservative, health protective and precedent-breaking approach. This is important because a PHG set below what NAS says is necessary may foster a mistaken public impression that perchlorate levels above the PHG are unsafe. Rather than working from the customary baseline of a No Adverse Effect Level, the NAS made the decision to work from the No Observed Effect Level of 245 ppb and then included an additional margin of safety it declared protective of the most sensitive subpopulations, including pregnant women and their fetuses, as well as newborns.

Setting the PHG is a preliminary step for developing a regulatory standard for drinking water, known as a Maximum Contaminant Level (MCL). To the extent California's PIIG is not based on the best available science, the resulting MCL could be unnecessarily restrictive and costly, forcing local governments to divert resources away from more pressing needs, while still not providing corresponding health benefits.

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The Council on Water Quality is supported by a subset of the member companies of the Perchlorate Study Group, including Aerojet, American Pacific Corporation, Kerr-McGee Chemical and Lockheed Martin. In the past decade, the Perchlorate Study Group has worked cooperatively with the U.S. Environmental Protection Agency to increase scientific and medical understanding of perchlorate's risk to human health.





CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

NEWS RELEASE

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

FOR IMMEDIATE RELEASE:

Release No. 05- 02

April 1, 2005

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**State's Drinking Water Goal For Perchlorate
Consistent With Findings Of Major Federal Study**

SACRAMENTO – The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) today announced that the state's Public Health Goal (PHG) for perchlorate in drinking water is consistent with the findings of a recent report on the chemical by the National Academy of Sciences (NAS). In light of the favorable NAS findings, OEHHA has determined that the PHG does not need to be revised.

The PHG, which was published in March 2004, identifies 6 parts per billion as a level of perchlorate in drinking water that does not cause or contribute to adverse health effects. Perchlorate is primarily produced for use in rocket fuel, explosives, fireworks, road flares and air-bag inflation systems, and has been detected in a number of California drinking water sources.

"The National Academy of Sciences report on perchlorate provides strong support for the approach that we took in developing our public health goal," OEHHA Director Dr. Joan E. Denton said. "The federal report, along with earlier peer reviews of our perchlorate assessment by University of California scientists, reinforces the solid scientific foundation that underlies California's efforts to safeguard drinking water from threats posed by perchlorate."

The NAS report, released in January 2005, evaluated the U.S. Environmental Protection Agency's 2002 Draft Toxicological and Risk Characterization for Perchlorate. In its report, the NAS examined scientific issues that were relevant to OEHHA's PHG for perchlorate. When it published the PHG in 2004, OEHHA announced it would review the NAS report upon its completion and, if necessary, revise the PHG. OEHHA has concluded no revision is needed because of the consistency between the NAS findings and OEHHA's assessment of perchlorate.

The key NAS findings were:

- The health effects of perchlorate should be assessed using data from clinical studies involving humans, rather than laboratory animals. The NAS specifically recommended the use of a well-regarded 2002 study in which healthy volunteers were administered perchlorate. OEHHA used that same study to assess perchlorate's health effects and develop the PHG.
- The perchlorate health effect of primary concern is the reduction of the uptake of iodide, an essential nutrient, by the thyroid gland (a butterfly-shaped gland in the



throat). While not harmful by itself, inadequate iodide uptake may lead to the harmful disruption of proper thyroid function. The NAS report said that the initial reduction of iodide uptake “is the key event that precedes all...effects of perchlorate exposure,” and that focusing on the reduction of iodide uptake “is the most health protective and scientifically valid approach.” OEHHA’s perchlorate assessment similarly focused on the reduction of iodide uptake as the critical health effect.

- The fetuses of pregnant women are “the most sensitive population” to perchlorate’s health effects, the NAS report said. OEHHA similarly concluded that pregnant women and fetuses were most sensitive to perchlorate after evaluating the chemical’s health effects on adults, infants and lactating women, as well as pregnant women and fetuses. To ensure that a perchlorate assessment does not underestimate the chemical’s effects on pregnant women and fetuses, the NAS recommended the same approach that OEHHA used in developing its PHG.

OEHHA did not identify any findings or recommendations in the report that conflicted with its PHG assessment. OEHHA and the NAS chose different methods for identifying general levels of perchlorate exposure that would not cause health effects, but the NAS report did not disagree with the method used by OEHHA. The NAS report did not calculate a safe level of perchlorate in drinking water, as this was outside the request made to the NAS.

In publishing the PHG, OEHHA used data from the 2002 study cited by NAS to identify 6 parts per billion as a level of perchlorate in drinking water that is protective of human health, including the health of pregnant women and fetuses. Impairment of thyroid function in pregnant women may affect the fetus and result in delayed development and decreased learning capability.

In a parallel development, OEHHA announced that a newly released study of perchlorate levels in human breast milk did not produce sufficient information to justify any revisions to the PHG. The study, published in February 2005 and authored by three Texas Tech University researchers, found elevated levels of perchlorate in breast milk samples from throughout the United States, including California. While important, the study did not find any correlation between perchlorate levels in the breast milk and drinking water of study participants, and was not designed to identify the sources of the perchlorate found in breast milk.

OEHHA will continue to monitor new scientific developments concerning perchlorate. State law requires OEHHA to review and, as necessary, update each PHG every five years.

State law next requires the California Department of Health Services (DHS) to set a regulatory drinking water standard for perchlorate that is as close to the PHG as is economically and technically feasible. A PHG is not a regulatory requirement, and it is not a boundary between “safe” and “dangerous” levels of a chemical in drinking water. PHGs are health-protective goals for drinking water contaminants that DHS uses in establishing drinking water standards. OEHHA develops PHGs for all regulated drinking water contaminants.



The Office of Environmental Health Hazard Assessment is one of six entities within the California Environmental Protection Agency. OEHHA's mission is to protect and enhance public health and the environment by objective scientific evaluation of risks posed by hazardous substances.

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