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Submitted Via E-Mail

Mr. Michael Baes
Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
1515 Clay St., 16th floor
Oakland, California 94612
Attention: PHG Project
Email: michael.baes@oehha.ca.gov

Re: Solicitation of Public Comments on the Draft Technical Support Document for the Proposed Public Health Goal for Perchlorate in Drinking Water

Dear Mr. Baes:

The American Chemistry Council¹ (ACC) appreciates this opportunity to provide comments to the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) regarding the revised draft technical support document (draft document) for a proposed updated Public Health Goal (PHG) for perchlorate in drinking water. The ACC Chlorine Chemistry Division represents the major producers and users of chlorine in North America and works to promote the sustainability of chlorine chemistry processes, products and applications. The following comments identify several issues with the scientific justification used to support the proposed PHG of 1 part per billion (ppb). Based on these comments OEHHA should withdraw its proposal to lower the perchlorate PHG to 1ppb.

Lowering the PHG Provides No Additional Public Health Benefit

The current scientific literature illustrates that perchlorate is one of the most well-studied chemicals with detailed information on the mechanism of action, dose-response, and health effects. The current OEHHA PHG of 6 ppb was set in 2004 and since that time

¹ ACC represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a \$760 billion enterprise and a key element of the nation's economy. It is the largest exporting sector in the U.S., accounting for 12 percent of U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.



the National Research Council (NRC) has published a comprehensive review² of the perchlorate science. Specifically, the NRC evaluated the available epidemiological and animal data associated with perchlorate and iodine uptake inhibition and noted that “*effects downstream of inhibition of iodide uptake by the thyroid have not been clearly demonstrated in any human population exposed to perchlorate, even at doses as high as 0.5mg/kg per day.*” Additionally recent animal and human studies published since 2005 have reinforced the NRC’s conclusion.

OEHHA notes in its draft document that “*In our review of the literature, we determined that infants are likely to be particularly susceptible to perchlorate, although other groups were also identified as likely having increased susceptibility, including fetuses, preterm infants, pregnant women, those with low intakes of iodine, and those exposed to other chemicals in food and water that, like perchlorate, also block iodide uptake into the thyroid. (Page 2 of draft document)*” However, the weight of evidence linking perchlorate to thyroid changes is limited and inconsistent. For example, while Blount et al. (2006)³ found a perchlorate-related increase in thyroid stimulating hormone (TSH) and decrease in thyroxine (T4) in women; Pearce et al. (2011⁴, 2010⁵) did not find an association between urinary perchlorate and thyroid hormone perturbations in first trimester pregnant women. Additionally, Amitai et al. 2007⁶ found no change in neonatal T4 levels despite maternal consumption of drinking water that contained perchlorate at levels in excess of the Environmental Protection Agency (EPA) drinking water equivalent level (24.5 µg/L) based on the NRC reference dose (RfD) [0.7 µg/kg per day]. A 2010 review of the available epidemiological data on perchlorate by Tarone et al.⁷ also found that “*There is no epidemiologic evidence that environmental or occupational exposure to perchlorate adversely affects thyroid function in the United States.*”

Importantly, Tarone et al. note “*Even if all perchlorate could be removed from the environment, >99% of the inhibition of iodide uptake in the thyroid resulting from exposure to environmental goitrogens would remain.*” Thus it remains unclear what added public health benefit reducing the PHG for perchlorate would provide.

² National Research Council of the National Academies. (2005). Health Implications of Perchlorate Ingestion. Available at http://www.nap.edu/catalog.php?record_id=11202.

³ Blount B, Pirkle J, Osterloh J, Valentin-Blasini L, and Caldwell K. (2006). Urinary perchlorate and thyroid hormone levels in adolescent and adult men and women living in the United States. *Environ Health Perspect.* 114(12):1865-1871.

⁴ Pearce E, Spencer C, Mestman J, Lee R, Bergoglio L, Mereshian P, He X, Leung A, and Braverman L. (2011). Effect of environmental perchlorate on thyroid function in pregnant women from Cordoba, Argentina, and Los Angeles, California. *Endocrine Practice: Official Journal of the American College of Endocrinology and the American Association of Clinical Endocrinologists.* 17(3): 412-417.

⁵ Pearce E, Lazarus J, Smyth P, He X, Dall’Amico D, Parkes A, Burns R, Smith D, Maina A, Bestwick J, Jooman M, Leung A, and Braverman L. (2010). Perchlorate and thiocyanate exposure and thyroid function in first-trimester pregnant women. *The Journal of Clinical Endocrinology and Metabolism.* 95(7): 3207-3215.

⁶ Amitai Y, Winston G, Sack J, Wasser J, Lewis M, Blount B, Valentin-Blasini L, Fisher N, Israeli A, and Leventhal A. (2007). *Thyroid.* September, 17(9): 843-850.

⁷ Tarone R, Lipworth L, and McLaughlin J. (2010). The Epidemiology of Environmental Perchlorate Exposure and Thyroid Function: A Comprehensive Review. *Journal of Occupational & Environmental Medicine: June - Volume 52 - Issue 6 - pp 653-660.*



OEHHA specifically notes in the draft document that “*Several other chemicals that people are commonly exposed to, such as nitrate, thiocyanate, and bromide, can also compete with iodide for uptake into the thyroid.*” Notably, De Groef et al. 2005⁸ found that nitrate and thiocyanate, acquired through drinking water or food, accounted for a much larger proportion of iodine uptake inhibition than perchlorate. Furthermore, the iodine uptake inhibitory effects of nitrate and thiocyanate exceed the potential effect of the current EPA RfD for perchlorate. De Groef et al. also found that iodine uptake inhibition and any potential downstream effects of perchlorate exposure are highly dependent on the presence of other environmental sodium (Na⁺)/iodide (I⁻) symporter (NIS) inhibitors and iodine intake itself.

This conclusion was validated in a 2010 report by US EPA’s Office of the Inspector General (OIG) entitled “*Scientific Analysis of Perchlorate.*”⁹ In particular the OIG stated that “*Our analysis implemented a cumulative risk assessment that found the following: (1) the risk from each of the four NIS stressors is not equal; (2) EPA’s perchlorate RfD is conservative and protective of human health, and further reducing the perchlorate exposure below the RfD does not effectively lower risk; (3) increasing maternal total iodide intake to healthy levels will reduce the frequency and severity of permanent mental deficits in children; and (4) correcting moderate and mild iodide deficiency occurring in about 29 percent of the U.S. pregnant and nursing population is the most effective approach for reducing risk.*” Thus it seems important that OEHHA adequately consider the relative public health benefit lowering the PHG for perchlorate would have on reducing any health impacts associated with iodine uptake inhibition given the contribution of other chemicals also present in the environment with the ability to inhibit iodine uptake.

In addition to the above studies, a 2011 review of available biomonitoring and occurrence data by Huber et al.¹⁰ illustrates that at the 95th percentile intake for both the total population and women of child-bearing age, the perchlorate contribution from food was 86% and from drinking water 14%. Thus an average 66 kg pregnant woman consuming a 90th percentile food dose (i.e. 0.198 µg/kg/day) could also consume the 90th percentile of drinking water volume for pregnant women (0.033 l/kg/day) containing 15 µg/l perchlorate without exceeding the NRC’s calculated RfD of 0.7 µg/kg/day. As well, Bruce et al. 2012¹¹ conducted a review of the National Health and Nutrition Examination Survey (NHANES) urinary data for 2001 to 2002 and found no evidence of functional thyroid abnormality (e.g., low thyroid hormone coupled with high thyroid stimulating hormone) with combined exposure to nitrate, thiocyanate, and perchlorate. These studies

⁸ De Groef B, Decallonne B, Van der Geyten S, Darras V, and Bouillon R. (2006). Perchlorate versus other environmental sodium/iodide symporter inhibitors: potential thyroid-related health effects. *Eur J Endocrinol.* Jul; 155(1):17-25.

⁹ <http://www.epa.gov/oig/reports/2010/20100419-10-P-0101.pdf>

¹⁰ Huber D, Blount B, Mage D, Letkiewicz F, Kumar A, and Allen R. (2011). Estimating perchlorate exposure from food and tap water based on US biomonitoring and occurrence data. *Journal of Exposure Science and Environmental Epidemiology.* 21, 395–407

¹¹ Bruce G, Corey L, Mandel J, Pleus R. (2012). Urinary Nitrate, Thiocyanate, and Perchlorate and Serum Thyroid Endpoints Based on NHANES 2001 to 2002. *J Occup Environ Med.* Sep 26.



further illustrate that reducing the contribution of perchlorate in the drinking water would not have any added public health benefit

Proposed PHG of 1ppb is Overly Conservative and Scientifically Unwarranted

OEHHA's current PHG is derived from an Acceptable Daily Dose (ADD) based on perchlorate's ability to inhibit the thyroidal uptake of iodide by competing for the NIS, the protein responsible for transporting iodide into the thyroid gland for the purpose of synthesizing thyroid hormones. The NRC cited the same endpoint in 2005 as the basis for its perchlorate RfD. Notably, because iodide uptake inhibition does not constitute an adverse effect in and of itself, its choice as the basis for OEHHA's ADD is health-protective with a large margin of safety. This fact does not seem to have been given adequate consideration in the derivation of the proposed PHG.

In the draft document, OEHHA selects infants as the most susceptible population and bases the PHG solely on this population even though OEHHA calculates health protective drinking water concentrations (C) for several subpopulations (i.e. Infants, C = 1.13 µg/L; Pregnant women, C = 6.29 µg/L, Lactating women, C = 4.92 µg/L, Females, C = 7.10 µg/L and Adults, C = 6.00 µg/L). This proposed approach is scientifically unwarranted and overly conservative considering that: (1) OEHHA's proposed ADD is already nearly 50% below the point of departure observed by Greer et al. (2002)¹²; a function of OEHHA's use of benchmark dose methodology rather than the no observed effect level (NOEL) approach recommended by the NRC; (2) the ADD, with an uncertainty factor of 10, already adequately accounts for differences in sensitivity between the healthy adults in the Greer et al. study and the most sensitive populations; and (3) OEHHA incorporates infant-specific exposure adjustments in the PHG calculation which provide a redundant level of protection relative to the 10-fold uncertainty factor; and (4) the critical endpoint, iodine uptake inhibition used by OEHHA to derive the PHG, is not in and of itself an adverse health effect.

In essence, OEHHA seems to imply that any initiating events that have even the slightest potential to pose a downstream adverse physiological effect should be considered adverse. This is a critically important science policy change that has ramifications for future PHG risk assessments. In fact, OEHHA has not provided adequate information to identify the threshold level of perchlorate exposure needed to illicit the perturbations in iodine uptake that are necessary to trigger thyroid changes that may result in adverse health impacts. In fact, no definitive scientific evidence exists that demonstrates a correlation between environmentally relevant concentrations of perchlorate and adverse health effects in the U.S. population

ACC appreciates OEHHA's consideration of these comments and we recommend OEHHA withdraw its proposal to lower the perchlorate PHG to 1ppb. The current state of the science for perchlorate clearly illustrates that perchlorate does not pose a health risk at environmentally

¹² Greer M, Goodman G, Pleus R, and Greer S (2002). Health effects assessment for environmental perchlorate contamination: the dose response for inhibition of thyroidal radioiodine uptake in humans. *Environ Health Perspect* 110(9):927-937.



relevant exposure levels and lowering the PHG without notable human health benefit may divert valuable resources that could otherwise be dedicated to more tangible improvements to public health. If you have questions, please feel free to contact me by phone at 202-249-6707 or via email at Kimberly.Wise@americanchemistry.com.

Respectfully,

Kimberly Wise, Ph.D.
Senior Director
Chemical Products & Technology Division
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cc: Cliff Rechtschaffen – Governor’s Office
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John Laird – Secretary, Natural Resources Agency
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