**November 14, 2018**

**Comments on the California Office of Environmental Health Hazard Assessment Draft Technical Support Document for Proposed Public Health Goals for Trihalomethanes in Drinking Water**
Available at: https://oehha.ca.gov/water/crnr/announcement-availability-draft-technical-support-document-proposed-public-health-goals

Environmental Working Group, a nonprofit research and policy organization with offices in San Francisco, Sacramento, Minneapolis and Washington, D.C., submits these comments in support of the proposed public health goals for four trihalomethanes in drinking water from the California Office of Environmental Health Hazard Assessment (OEHHA).

Drinking water disinfection is essential because it protects people from water-borne microbial diseases. But when chlorine and other disinfectants react with plant matter and animal waste in drinking water supplies, they form harmful contaminants, known collectively as disinfection byproducts. It is critical that water is free of pathogens, but every measure must also be taken to decrease the amount of disinfection byproducts in finished drinking water served at the tap. These unintended water pollutants increase the risk of cancer[1] and may damage developing fetuses.[2] People are also exposed to disinfection byproducts when bathing or using swimming pools.

In the first public review draft published on October 5, 2018, OEHHA presented the following public health goals: 0.4 parts per billion (ppb) for chloroform, 0.5 ppb for bromoform, 0.06 ppb for bromodichloromethane, and 0.1 ppb for dibromochloromethane. These public health goals correspond to a one-in-a-million risk values and represent the level of a drinking water contaminant at which adverse health effects are not expected to occur from a lifetime of exposure.

EWG strongly agrees with OEHHA's proposed public health goals. In this letter, we focus on three aspects of OEHHA's approach that make the proposed public health goals reliable and protective of human health for everyone, including those in vulnerable life stages, such as young children and the developing fetus.

[1] Richardson SD, Plewa MJ, Wagner ED, Schoeny R, Demarini DM (2007). Occurrence, genotoxicity, and carcinogenicity of regulated and emerging disinfection by-products in drinking water: a review and roadmap for research. Mutat Res. 636(1-3): 178-242.
[2] Colman J, Rice GE, Wright JM, Hunter ES 3rd, Teuschler LK, Lipscomb JC, Hertzberg RC, Simmons JE, Fransen M, Osier M, Narotsky MG (2011). Identification of developmentally toxic drinking water disinfection byproducts and evaluation of data relevant to mode of action. Toxicol Appl Pharmacol. 254(2): 100-26.

**First**, cancer-based public health goals for trihalomethanes are supported by the findings of human epidemiological studies. The literature on disinfection byproducts and cancer is vast, and OEHHA cites the relevant references in the draft document. Here we highlight the observed association of disinfection byproducts with colorectal cancer[3] and bladder cancer.[4] Thus, it is essential to define what concentrations of specific disinfection byproducts are associated with minimal risk.

**Second**, EWG applauds OEHHA's approach of using Age Sensitivity Factors for different life stages. OEHHA's pioneering 2009 analysis[5] convincingly demonstrated the need to use age-specific susceptibility factors for assessment of carcinogens' impact on human health. This approach is also supported by the findings from peer-reviewed research literature[6] which, in aggregate, demonstrate that, at a minimum, a susceptibility factor of 10 should be applied to account for the greater vulnerability of infants and the developing fetus to toxic chemicals.

**Third**, the one-in-a-million cancer risk levels for four trihalomethanes published by OEHHA are fully consistent with the estimated cancer risk levels for trihalomethanes presented in a risk assessment published in 2015 by the U.S. EPA and academic researchers.[7] Specifically, a study by S. Regli et al., (2015) analyzed the lifetime risk from exposure to trihalomethanes in drinking water and reported that each 1 μg/L (equivalent to ppb) increase in trihalomethane concentration corresponded to $10^{-4}$ added lifetime risk of bladder cancer. OEHHA's draft document cited the study but did not use it for the development of the public health goals. However, this study provides strong supporting information for the OEHHA's assessment, and EWG urges OEHHA to discuss the findings of this research in greater detail.

Specifically, Regli et al. analyzed bladder cancer risk, from six epidemiological studies previously published as a meta-analysis by Villanueva et al. (2003),[8] as a function of trihalomethane exposure from tap water. As the study reported, this experimentally

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[3] Rahman MB, Driscoll T, Cowie C, Armstrong BK (2010). Disinfection by-products in drinking water and colorectal cancer: a meta-analysis. Int J Epidemiol. 39(3): 733-45.
[4] Salas LA, Cantor KP, Tardon A, Serra C, Carrato A, Garcia-Closas R, Rothman N, Malats N, Silverman D, Kogevinas M, Villanueva CM (2013). Biological and statistical approaches for modeling exposure to specific trihalomethanes and bladder cancer risk. Am J Epidemiol. 178(4): 652-60.
[5] OEHHA (2009). Technical support document for cancer potency factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. Available at https://oehha.ca.gov/media/downloads/crnr/tsdcancerpotency.pdf
[6] Barton HA, Cogliano VJ, Flowers L, Valcovic L, Setzer RW, Woodruff TJ (2005). Assessing susceptibility from early-life exposure to carcinogens. Environ Health Perspect 113:1125-1133.
[7] Regli S, Chen J, Messner M, Elovitz MS, Letkiewicz FJ, Pegram RA, Pepping TJ, Richardson SD, Wright JM (2015). Estimating Potential Increased Bladder Cancer Risk Due to Increased Bromide Concentrations in Sources of Disinfected Drinking Waters. Environ Sci Technol. 49(22): 13094-102.
[8] Villanueva CM, Fernandez F, Malats M, Grimalt JO, Kogevinas MA (2003) A meta-analysis of studies on individual consumption of chlorinated drinking water and bladder cancer. J Epidemiol Community Health. 57:166-173.

observed dose-response relationship between cancer risk and exposure is complex, since it is nearly linear at higher exposure levels; convex in the mid-dose exposure range; and concave, or supra-linear, at lower doses. This potential supra-linearity at lower doses would indicate that the dose-response relationship might be steeper at lower concentrations and that a linear relationship may be conservative.

Starting with the Regli et al. finding that a 1 ppb increase in trihalomethane concentration corresponds to $10^{-4}$ added lifetime risk, and assuming the linearity of dose-response relationship, we calculate that 0.01 ppb concentration of total trihalomethanes would correspond to $10^{-6}$ added lifetime cancer risk. This 0.01 ppb concentration for one-in-a-million cancer risk is below OEHHA's proposed public health goals for individual trihalomethanes, which are in the 0.06-0.5 ppb range. EWG finds that the public health goals published by OEHHA are conservative and consistent with human data.

**In conclusion,** EWG strongly supports OEHHA's proposed public health goals for trihalomethanes and the methodology used to derive the cancer risk values for these chemicals. OEHHA's draft PHGs represent a valuable step ahead for protecting the health of Californians, and EWG urges OEHHA to finalize these proposed values as the final public health goals for the state of California.

Submitted on behalf of the Environmental Working Group,

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