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Thank you, Madam Chairperson and members of this Committee, for the opportunity to testify on perchlorate and trichloroethylene in water.

I am George Alexeeff, Deputy Director for Scientific Affairs of the Office of Environmental Health Hazard Assessment (OEHHA) of the California Environmental Protection Agency. I am a toxicologist by training. For over 20 years, I have worked in the field of risk assessment, evaluating the risks that chemicals in the environment pose to the public's health. I oversee a staff of scientists who evaluate the health impacts of pollutants and toxicants in the air, water and soil. As part of our duties under the California Safe Drinking Water Act of 1996, OEHHA develops public health goals (PHGs) for drinking water. Public health goals are California's equivalent to the federal MCLGs – they identify a level of a contaminant in drinking water that does not pose a health risk, and they are used by our sister agency, the California Department of Public Health, to develop California's regulatory drinking water standards.

My testimony today focuses on the public health goals we have developed to address contamination of drinking water with the chemicals perchlorate and trichloroethylene, or TCE.

Perchlorate has been detected in hundreds of drinking water sources in California, including water sources in heavily populated areas such as Riverside, San Bernardino, Los Angeles, Santa Clara and Sacramento counties. It has also been detected in the Colorado River, a major drinking source for Southern California. Our health concern is this: Perchlorate inhibits the uptake of iodide, an essential nutrient, by the thyroid gland. Inadequate iodide uptake disrupts proper thyroid function. Thyroid hormones, such thyroxine (T4) and triiodothyronine (T3), help regulate the growth and maturation of tissues, particularly the brain. Disruption of these hormones due to iodine deficiency can lead to impaired growth and development in fetuses. Several epidemiological studies indicate that iodine deficiency during pregnancy may affect brain development and may cause intellectual deficits in children. One study found that, even when the mother's iodine deficiency was borderline and the children appeared to be normal, their school achievement was impaired (Glinos, 2001).

In our review of the scientific literature, we found that four populations are particularly susceptible to the adverse health effects of perchlorate. First, the fetuses of pregnant women are the most sensitive to perchlorate's health effects. Impairment of thyroid function in expectant mothers may affect the brain of the fetus, resulting in delayed development and decreased learning capability. The second sensitive population includes newborns and infants. They require iodide for proper brain development. The newborn may receive an inadequate amount of iodide when breast-feeding if the mother is exposed to perchlorate. In addition, the newborn may receive perchlorate in the breast milk. The perchlorate can further reduce the newborn's ability to produce the thyroid hormones needed for proper brain development. The third group includes the pregnant and lactating women themselves. These women require higher levels of iodide since they have to maintain adequate levels for themselves and their offspring. The last sensitive group includes individuals with preexisting thyroid problems.

In 2004, OEHHA published a public health goal for perchlorate in drinking water of 6 parts per billion. This level was adopted in 2007 by the California Department of Public Health as the state's drinking water standard for perchlorate.

Before publishing the final PHG, OEHHA's draft perchlorate assessment underwent two rounds of independent peer review by University of California scientists, as well as several public comment periods. We based our PHG on a controlled human study where the subjects drank specific amounts of perchlorate in their water and the effects on iodide uptake were measured (Greer et al. 2002). This study, referred to as the “Greer study,” is well-regarded and contained the best data for assessing perchlorate’s health effects. However, this study was limited because there were only 37 subjects. To ensure that a perchlorate assessment does not underestimate the chemical’s effects on pregnant women and fetuses, we added a 10-fold margin of safety. Our PHG also took into account the higher water consumption rate of pregnant women and the potential for perchlorate exposure from food.

In 2005, the National Academy of Sciences (NAS) recommended a toxicity evaluation approach very similar to the one OEHHA used (National Research Council, 2005). They reported that the reduction of iodide uptake “is the key event that precedes all thyroid-mediated effects of perchlorate

exposure,” and that focusing on the reduction of iodide uptake “is the most health protective and scientifically valid approach.”

Since the publication of our PHG, the U.S. Centers for Disease Control released a major national study of over 2000 men and women which supports the concerns that we identified in our assessment of perchlorate (Blount et al. 2006). The CDC study found that in women perchlorate exposure was associated with changes in thyroid hormone levels. The thyroid hormone level changes were consistent with the expected effects of perchlorate, that is, women with higher perchlorate levels also had greater thyroid disruption. OEHHA evaluated this data and published a confirmatory article exploring further relationships between perchlorate, iodine, thyroid hormone, and other environmental chemicals (Steinmaus et al, 2007). OEHHA will consider the new data as part of our five year re-review process for PHGs.

I will turn now to trichloroethylene or TCE. Over 350 drinking water sources in California have reportable levels of TCE contamination (i.e., greater than 0.5 ppb). Cancer is the primary health concern from TCE exposure. Animal studies indicate that inhaling TCE induced liver

carcinomas in male mice and lung carcinomas in female mice. Oral exposure to TCE induced liver carcinomas in both male and female mice. Kidney tumors were reported in male rats after inhalation and after oral exposure to TCE. The National Toxicology Program has concluded that TCE is *reasonably anticipated to be a human carcinogen*.

Over the past 20 years, California has consistently treated TCE as a carcinogen in our air, water, and other programs. In April 1988, California listed trichloroethylene as a “chemical known to the state to cause cancer” (under the California Safe Drinking Water and Toxic Enforcement Act of 1986, also known as Proposition 65). In 1990, we developed a “no significant risk” level to help businesses determine when Californians must receive Proposition 65 warnings concerning exposure to TCE. Also that year, we reviewed trichloroethylene for our air toxics program and again concluded that it should be considered a carcinogen for purposes of public health protection. TCE was listed as a toxic air contaminant based on the carcinogenic effects.

In 1999, OEHHA published a public health goal (under the California Safe Drinking Water Act of 1996) of 0.8 parts per billion trichloroethylene in

drinking water. In developing this PHG, we reviewed the animal studies and the limited data from human studies. We found that the limited human data supported conclusions regarding cancer in animals, that is, the estimate based on animal data was similar to the one we obtained using data on kidney cancer from a human occupational study. Our risk assessment confirmed that this chemical is a potential human carcinogen. Our PHG of 0.8 ppb represents a one in one million risk of developing cancer after a lifetime of exposure to TCE at this level.

TCE is currently under re-review in the OEHHA drinking water program. We have followed the USEPA cancer review process with great interest, and awaited the publication of the National Academy of Sciences report, released in 2006. We note that the NAS concluded that the evidence on carcinogenic risk and other health hazards from exposure to trichloroethylene has strengthened since 2001. We expect to release our revised risk assessment document for public comment later this year.

I hope this summary gives you a better idea of why California has concerns about perchlorate and trichloroethylene in water and how we have identified

their level of risk to public health. Thank you for giving me the opportunity to testify before you today.

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