

MEMORANDUM

TO: Val F. Siebal
Chief Deputy Director

VIA: George V. Alexeeff, Ph.D., D.A.B.T.
Deputy Director for Scientific Affairs

VIA: Anna M. Fan, Ph.D., Chief
Pesticide and Environmental Toxicology Section

FROM: Robert A. Howd, Ph.D., Chief
Water Toxicology Unit
Pesticide and Environmental Toxicology Section

DATE: August 17, 2004

SUBJECT: UPDATE OF PHG - THALLIUM

Under the Calderon-Sher California Safe Drinking Water Act of 1996, the Office of Environmental Health Hazard Assessment (OEHHA) develops public health goals (PHG) for regulated chemicals in drinking water and reviews and updates the risk assessments every five years (Health and Safety Code Section 116365(e)(1)). This memorandum represents an update of the literature review and evaluation for an update of the existing PHG for thallium (OEHHA, 1999). Our re-evaluation supports the previous PHG derivation in 1999 and we conclude that the PHG for thallium should remain at 0.1 parts per billion (ppb).

Summary of review

We have surveyed the scientific literature for recently published thallium research studies to determine if there may be available studies that would have some impact on the existing PHG value of 0.1 ppb thallium in drinking water. Additionally, we reviewed earlier studies to determine if endpoints or other data that could modify the PHG value had been overlooked in the development of the first thallium PHG document in 1999, and reviewed earlier comments to determine whether all had been adequately addressed.

No relevant new studies were found that might affect the existing PHG value, or would give significant added value to the PHG review document. One relevant earlier animal study (Rossi *et al.*, 1988) was found that was not cited in the previous document, and another (Formigli *et al.*, 1986) when given additional analysis, provided data that support OEHHA's existing PHG. The lowest-observed-adverse-effect levels (LOAELs) from these studies, when divided by an

uncertainty factor of 10 to account for extrapolation from a LOAEL to a no-observed-adverse-effect level (NOAEL), provide values that are about 50 percent higher than the NOAEL of 0.04 mg/kg-day from the study from which OEHHHA derived the current PHG value (Stoltz *et al.*, 1986). The Formigli *et al.* (1986) LOAEL is based on loss of sperm motility in rats after 60 days of thallium exposure. The Rossi *et al.* (1988) LOAEL is based on impairment in development of the autonomic nervous system in rats from both prenatal and postnatal exposures to thallium. These studies support and strengthen the NOAEL of 0.04 mg/kg-day for alopecia (hair loss) and evidence of liver damage from the study by Stoltz *et al.* (1986), and provide no basis for any change in selecting the critical study or the thallium PHG value. In addition, we note that all substantive comments were addressed earlier.

Our re-evaluation supports the PHG derivation used in the 1999 document. We conclude that the public health goal for thallium should be unchanged from the previous risk assessment, at 0.1 ppb.

The U.S. EPA reference dose for thallium is expressed in terms of various thallium salts (U.S. EPA, 2004a), based on the same subchronic study in rats as used in our PHG development. U.S. EPA chose to consider the dose that resulted in alopecia and increased serum enzymes indicative of liver damage as a NOAEL, which is why the federal values are higher than those estimated by OEHHHA.

The California Department of Health Services (DHS) reviewed the 1999 PHG for thallium, and maintained the Maximum Contaminant Level (MCL) for thallium in drinking water at 2 ppb. The California DHS determined that the MCL for thallium should not be decreased to more closely approximate the PHG because the PHG level is below the Detection Limit for the Purpose of Reporting (DLR), currently 1 ppb (DHS, 2004b). The federal MCL is also 2 ppb, with a Maximum Contaminant Level Goal of 0.5 ppb (U.S. EPA 2004b).

References

DHS (2004a). MCLs, DLRs and PHGs for regulated drinking water contaminants. California Department of Health Services, Sacramento, CA. Accessed at:
<http://www.dhs.ca.gov/ps/ddwem/chemicals/phgs/chemicalinformation.htm>

DHS (2004b). Status of MCL reviews in response to PHGs. March 2004 update. California Department of Health Services, Sacramento, CA. Accessed at:
<http://www.dhs.ca.gov/ps/ddwem/chemicals/PHGs/reviewstatus.htm>

Formigli L, Scelsi R, Poggi P, Gregotti C, Di Nucci A, Sabbioni E, Gottardi L, Manzo L (1986). Thallium-induced testicular toxicity in the rat. *Environ Res* 40:531-9.

Val F. Siebal
August 17, 2004
Page 3

OEHHA (1999). Public Health Goal for thallium in drinking water. Office of Environmental Health Hazard Assessment, Berkeley and Sacramento, CA. Accessible at <http://www.oehha.ca.gov/water/phg/index.html>.

Rossi F, Marrazzo R, Berrino L, De Santis D, Lisa M, Susanna V, Montanaro C, Fici F, Marmo E (1988). Prenatal and postnatal thallium exposure in rats: Effect on development of vasomotor reactivity in pups. *Teratogen Carcinogen Mutagen* 8:13-23.

Stoltz ML, Stedham MA, Brown LK, Laber L, El-Hawari AM (1986). Subchronic (90-day) toxicity of thallium (I) sulfate (CAS No. 7446-18-6) in Sprague-Dawley rats. Final Report. Project no. 8702-L(18). Prepared for U.S. Environmental Protection Agency by Midwest Research Institute.

U.S. EPA (2004a). Thallium chloride (CASRN 7791-12-0). Integrated Risk Information System. U.S. Environmental Protection Agency, Washington, DC. Accessed at: <http://www.epa.gov/iris/subst/0113.htm>.

U.S. EPA (2004b). List of drinking water contaminants and MCLs. Office of Water, U.S. Environmental Protection Agency, Washington, DC. Accessed at: <http://www.epa.gov/safewater/mcl.html#mcls>.

cc: Tom Parker, M.Sc.
Associate Toxicologist
Office of Environmental Health Hazard Assessment