Division of Environmental Health
Maine Center for Disease Control and Prevention
Department of Health & Human Services

Environmental & Occupational Health Program

Interdepartmental Memo

To: David W. Wright, DEP
From: Pamela Wadman, Toxicologist, EOHP
cc: Andrew E. Smith, ScD, State Toxicologist, EOHP
Date: October 19, 2012
Re: Summary of Changes to Maximum Exposure Guidelines – October 2012 Update

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This memo summarizes changes to existing Maximum Exposure Guidelines (MEGs), due to updates to the toxicity values used to calculate the risk based concentrations (RBCs), since the last MEG update, September 30, 2011. Changes in the MEGs reflect updates in the reference dose (RfD) and/or cancer slope factors (CSF) in EPA's Integrated Risk Information System (IRIS) chemical toxicity profiles. Six MEGs have changed: chlorpyrifos, cis-1,2-dichloroethylene, dichloromethane, tetrachloroethylene, tetrahydrofuran, and 1,2,3-trichloropropane. In addition, the values for three MEGS 3,3-dichlorobenzidine, alpha-hexachlorocyclohexane, and perchlorate have been rounded to the nearest single significant figure. The rationale for these changes is described below and the updated values are presented in Table 1.

Chlorpyrifos

The IRIS profile for chlorpyrifos was updated March 24, 2011, and the RfD, 0.003 milligram per kilogram body weight-day (mg/kg-day) based on a sub-chronic No Observed Adverse Effect Level (NOAEL) for cholinesterase inhibition in human volunteers, was removed. In accordance with the ME-CDC toxicity value hierarchy, the MEG is now derived using an ATSDR minimum risk level (MRL) of 0.001 mg/kg-day, established in 1997, based on a No Observed Adverse Effect Level (NOAEL) for cholinesterase inhibition from a chronic feeding study in rats. This update results in the MEG changing from 20 parts per billion (ppb) to 10 ppb.

Dichloroethylene (cis-1,2)

The former MEG (70 ppb) was calculated using a peer reviewed provisional toxicity value (PPRTV) of 0.01 mg/kg-day, based on a NOAEL for anemia from a 90-day study in rats. IRIS updated the toxicity profile for cis-1,2-dichloroethylene September 30, 2010 with addition of a RfD based on a benchmark dose limit ($BMDL_{10}$) for increased kidney weight in a 90-day study in rats. In 2011, a MEG of 20 ppb was established based on the updated IRIS RfD, however an error in that calculation resulted in use of a RfD of 0.003 mg/kg-day to derive a MEG of 20 ppb, instead of the correct RfD (0.002 mg/kg-day). The corrected MEG for cis-1,2-dichloroethylene is 10 ppb.

Dichloromethane

EPA updated the IRIS profile for dichloromethane November 18, 2011 with revisions to both the RfD and CSF. The CSF of $7.5E^{-3}$ $(mg/kg\text{-}day)^{-1}$ was updated to $2E^{-3}$ $(mg/kg\text{-}day)^{-1}$ for hepatocellular carcinomas or ademonas in a chronic mouse study, resulting in a 3.75 fold increase in the MEG for cancer effects. The previous non-cancer MEG relied on an ATSDR MRL of $6E^{-2}$ mg/kg-day based on a NOAEL for liver toxicity in a chronic rat study. IRIS published an RfD of $6E^{-3}$ mg/kg-day based on $BMDL_{10}$ for liver toxicity in a chronic rat study. This change results in a 10-fold decrease for the MEG for non-cancer effects. The non-cancer endpoint is now the lower of the two MEGs. The MEG for dichloromethane was revised from 50 ppb to 40 ppb to reflect this change.

Tetrachloroethylene

The IRIS profile for tetrachloroethylene was updated February 10, 2012 with revisions for both the RfD and CSF. The previous MEG for tetrachloroethylene (0.6 ppb) was based on a CSF of 0.54 $(mg/kg\text{-}day)^{-1}$ derived by California OEHHA for liver carcinomas in mice. The updated IRIS CSF, 0.0021 $(mg/kg\text{-}day)^{-1}$, is based on a BMDL from a chronic inhalation study for hepatocellular adenomas or carcinomas in mice. This represents more than a 200 fold decrease in cancer potency. The IRIS RfD for tetrachloroethylene was updated from 0.01 mg/kg-day for liver toxicity in a sub-chronic mouse study, to 0.006 mg/kg-day based a LOAEL for neurotoxic effects from a human occupational inhalation exposure study. This represents a 17 fold increase in the non-cancer risk. The previous MEG for tetrachloroethylene (0.6 ppb) was based on cancer risk, the updated MEG (40 ppb) is based on non-cancer hazard using the IRIS RfD.

Tetrahydrofuran

The previous MEG for tetrahydrofuran (70 ppb) used a RfD of 0.1 mg/kg-day, derived by the Maine Bureau of Health in 1999, based on a NOAEL for increased kidney weight in a chronic rat study, divided by an adjustment factor of 10 to account for potential carcinogenicity. The IRIS profile for

tetrahydrofuran was updated February 21, 2012 with an RfD of 0.9 mg/kg-day, based on decreased body weight gain in offspring from a 2 generation drinking water study in rats. The updated MEG (600 ppb) is based on the IRIS RfD, divided by an adjustment factor of 10 for suggestive evidence of carcinogenic potential.

Trichloropropane (1,2,3-)

The IRIS profile for 1,2,3-trichloropropane was updated September 30, 2009. The RfD was updated from an IRIS value of 0.006 mg/kg-day based on a NOAEL for reduced red blood cell mass in a sub-chronic rat study, to 0.004 mg/kg-day based on a $BMDL_{10}$ for increased absolute liver weight in a chronic rat feeding study. The CSF was updated from a HEAST value of 7 $(mg/kg\text{-}day)^{-1}$ for multiple tumor types in rats, to 30 $(mg/kg\text{-}day)^{-1}$ for multiple tumor types in mice. This four-fold increase in the CSF changes the MEG from 0.05 ppb, to 0.01 ppb.

Other changes:

The MEGs for three compounds: 3,3-dichlorobenzidine, alpha-hexachlorocyclohexane, and perchlorate have not changed from the previously published values, but have been rounded to the closest single significant figure to be consistent with the MeCDC Maximum Exposure Guidelines for Drinking Water development procedure.

TABLE I. July 2012 Updates to the Maximum Exposure Guidelines (MEGs)

	MEG 2012	MEG 2011	Health Advisory	MCL
Compound	Parts per billion (ppb)			
Chlorpyrifos	10	20		
Dichloroethylene (cis-1,2-)	10	20	70	70
Dichloromethane	40	50		5
Tetrachloroethylene	40	1	10	5
Tetrahydrofuran	600	70		
Trichloropropane (1,2,3-)	0.01	0.05		
Dichlorobenzidine (3,3-)	0.8	1	10	5
Hexachlorocyclohexane (alpha-)	0.06	0.1		
Perchlorate	0.8	1		