EPA-SAB-IAQC-92-016

March 13, 1992

Honorable William K. Reilly
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Subject: Science Advisory Board's Review of the Uptake Biokinetic Model for Lead.

Dear Mr. Reilly:

On November 7-8, 1991, the Indoor Air Quality and Total Human Exposure Committee of EPA's Science Advisory Board (SAB) reviewed the Agency's Uptake Biokinetic (UBK) Model for lead and evaluated its use in assessing total lead exposure and in aiding in developing soil lead cleanup levels at residential CERCLA/RCRA sites.

The Committee is impressed with the ambitious and thorough effort made by the Office of Solid Waste and Emergency Response (OSWER) to develop and refine a new and conceptually sound approach to human exposure assessment and to the establishment of exposure criteria for lead. This represents the first such effort for a toxicant for which the previous paradigm, used primarily for carcinogenic toxicants, cannot provide defensible total exposure estimates or cleanup criteria.. This is a difficult task for a pollutant such as lead, for which significant sources of exposure can include outdoor and indoor air, drinking water, and foods, as well as contaminated soil, dust, and leaded paint particles via inhalation of resuspended materials as well as by ingestion of material from hand-to-mouth contact.

We find the model to be basically sound, but we were concerned that the reliability of the results obtained using it were very much dependent on the selection of the various coefficients used for the variable terms, and of the specification of default values that would be used when suitable site-specific data were not available. Specifically:

a.   The Guidance Manual provides a number of recommendations for specific situations with Geometric Standard Deviations (GSD) ranging from 1.4 to 1.8, indicating that the authors feel that it is important to choose the right value if the model predictions are to be of value. Although it is clear that cleanup recommendations will be strongly dependent on GSD's chosen, we find it unlikely that the user will be guided to the "proper" GSD based on the criteria in the Manual.

b.   We believe that the concept of the use of default values should be discussed more clearly in the Manual. The Agency should provide more complete specific guidance on when default values should be used and when they should not. For situations where default values are not appropriate, the Agency should provide guidance on the methods for acquiring measured or sampled data.

We recommend that the Guidance Manual for the model include more explicit discussion of the basis for selecting the particular values to be used in a specific application, and of the uncertainties associated with such values and their impact on the overall uncertainty of the resulting model predictions.

We also question whether results obtained with earlier versions of the model are consistent with those from the model version that is currently distributed (version 0.40). Specifically, the non-linear absorption option for gastro-intestinal (GI) uptake and the modification of the Harley-Kneip response coefficients can produce significantly different blood lead estimates and bell-shaped probability density functions for given environmental concentrations and uptake rates than the earlier model endorsed by CASAC. We are concerned that using the current version of the model in the anticipated CERCLA/RCRA analyses could lead, incorrectly, to significantly different cleanup limits than would have been determined using earlier versions. Modifications which cause these differences require further discussion and, perhaps, additional peer review prior to SAB or EPA endorsement.

While refinements in the detailed specifications of the model will be needed, we are convinced that the approach followed in developing the UBK model was sound, and constitutes a valuable initiative in dealing with OSWER program needs in evaluating and controlling human exposures to lead. It can effectively be applied for many current needs even as it continues to undergo refinement for other applications, based upon experience gained in its use. The refinements will not only improve the scientific basis for evaluating and controlling lead, an essential Agency responsibility, but also provide a basis for the use of the model for other toxicants that present similar challenges. Examples could include arsenic, cadmium, and various polycyclic hydrocarbons.

The Science Advisory Board is pleased to have had the opportunity to review this draft document and to offer our advice. We would appreciate your response to the advice we have provided in the attached report.

Sincerely,
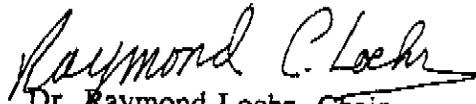
Dr. Raymond Loehr, Chair
Science Advisory Board

Dr. Morton Lippmann, Chair
Indoor Air Quality and Total
Human Exposure Committee