June 2009

Overview of Changes From IEUBKwin version 1 build 264 to IEUBKwin version 1.1

The following changes made have been made in this version of the Integrated Exposure Uptake Biokinetic (IEUBK) model software:

- updated model input variables for dietary lead exposure
- updated baseline maternal blood lead concentration (PbB) to make it consistent with recent data from the National Health and Nutrition Examination Survey (NHANES)
- replaced the discontinuous function relating age and bone weight with a continuous function
- changed the graphical user interface (GUI) to add a beginner mode to simplify use of the model for beginner users
- implemented a function to simplify calculation of Preliminary Remediation Goals (PRGs)
- simplified the help file structure.

Dietary Lead Update

Version 1.1 reflects new data on food lead concentrations from the Food and Drug Administration's (FDA) market basket survey. The updated default dietary intake values are based on data obtained by an analysis of the FDA Total Diet Study (FDA, 2006) and food consumption data from NHANES III (CDC, 1997).

Table 1. Default values for dietary lead intake in the IEUBK model.

Age Category (months)	IEUBK v1.0 Default Dietary Lead Intake (µg/day)	Previous Recommended Update Dietary Lead Intake (1991-1999 TDS data) (µg/day)	IEUBK v1.1 Updated Dietary Lead Intake Estimate (1995-2003 TDS data) (µg/day) [0.1LOD–0.9LOD]
0-11	5.53	3.16	2.26 [1.51–3.01]
12-23	5.78	2.60	1.96 [1.18–2.74]
24-35	6.49	2.87	2.13 [1.24–3.03]
36-47	6.24	2.74	2.04 [1.18–2.90]
48-59	6.01	2.61	1.95 [1.13–2.77]
60-71	6.34	2.74	2.05 [1.17–2.92]
72-84	7.00	2.99	2.22 [1.26–3.18]

Maternal Blood Lead Concentration

The default value of the maternal blood lead concentration variable has been changed from 2.5 to 1.0 µg/dL. This variable is used to specify the maternal blood lead concentration at childbirth. The updated value is based on an analysis of blood lead concentration data for women of child-bearing age (17-45 years) from NHANES 1999-2004.

Addressing the Discontinuity in Bone Weight Equation

In 2005, the National Academy of Science (NAS) recommended that the two functions relating age and bone weight in the IEUBK model be replaced with a single continuous function (NAS, 2005). The original equations (1a and 1b) produced a minor discontinuity in the age-bone weight relationship at age 12 months

The following equations were used in the IEUBK model to calculate bone weight:

For i = 0-12 months: $WTBONE[i] = 0.111WTBODY[i]$ Equations 1a

For i =13-84 months: $WTBONE[i] = 0.838 + 0.020i$ Equations 1b

Equation 2 reproduces the age-bone weight relationship of Equations 1a and 1b and eliminates the discontinuity at t=12 months.

$$WTBONE[i] = 0.40000 - 1.2748E\text{-}07(WTBODY[i])^4 + 2.5425E\text{-}05(WTBODY[i])^3 - 1.74500E\text{-}03(WTBODY[i])^2 + 6.7836E\text{-}02WTBODY[i] \quad \text{Equation 2}$$

IEUBKwin Version 1.1 replaces Equations 1a,b with Equation 2 and eliminates this discontinuity. As indicated by the NAS, this discrepancy was not likely to impact model results. We found this to be true; the change had negligible impact on model results.

Changes to the GUI

IEUBKwin Version 1.1 implements several changes to the GUI to make the model easier to use and understand. The model now presents users with 2 modes of operation: Advanced Mode and Beginner Mode. The Advanced Mode is similar to the operation of previous versions. The Beginner Mode guides new users through data entry using a wizard.

The GUI of IEUBKwin Version 1.1 also simplifies calculation of soil preliminary remediation goals (PRGs).

Changes to Help File Structure

The help file has been simplified to point users to internet-based guidance.

References

National Academy of Science. 2005. Superfund and Mining Megasites – Lessons from the Coeur d'Alene River Basing. National Academies Press, Washington, D.C. December. Available on-line at: http://www.epa.gov/superfundreports/coeur.htm.

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U.S. Food and Drug Administration (FDA). 2006. Total Diet Study. U. S. Food and Drug Administration Center for Food Safety and Applied Nutrition Office of Plant and Dairy Foods and Beverages (Accessed on May 16, 2006). Available online at The U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition Web site (http://www.cfsan.fda.gov/~comm/tds-toc.html).