SHORT SHEET:

How Do I Use Bioavailability Data From EPA Method 1340 In The IEUBK Model?

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Technical Review Workgroup Lead (Pb) Committee

Office of Land and Emergency Response

U.S. Environmental Protection Agency

Washington, DC 20460

Bioavailability information for lead in soil/dust that is reported by in vitro bioaccessibility (IVBA) assays (EPA Method 1340) typically needs to be converted to a predicted relative bioavailability (RBA) for use in human health risk assessment. The IVBA results are commonly reported as fractions ($IVBA_{fraction}$) which are converted to RBA(%) using the following equation:

$$RBA(\%) = (IVBA_{fraction} * 0.88 - 0.028) * 100 \qquad \text{Equation 1}$$

The Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) accepts absolute bioavailability (ABA) inputs as percentiles. To convert RBA to ABA for use in the model, multiply the RBA by 0.5 (ABA for lead acetate in water) and enter that value for the absorption fraction percent of soil and dust in the GI values/Bioavailability Information menu in the IEUBK model. For example, IVBA results from the lab reported a result of 0.624 for a soil sample. This would be converted to a lead RBA of 52% in the soil/dust sample using Equation 1 (above). The ABA of the sample would be 26% (52% * 0.5 = 26%). The percentile value 26 would be entered into the IEUBK model as the absorption fraction in the soil and dust fields of the GI Values/Bioavailability window as shown below.

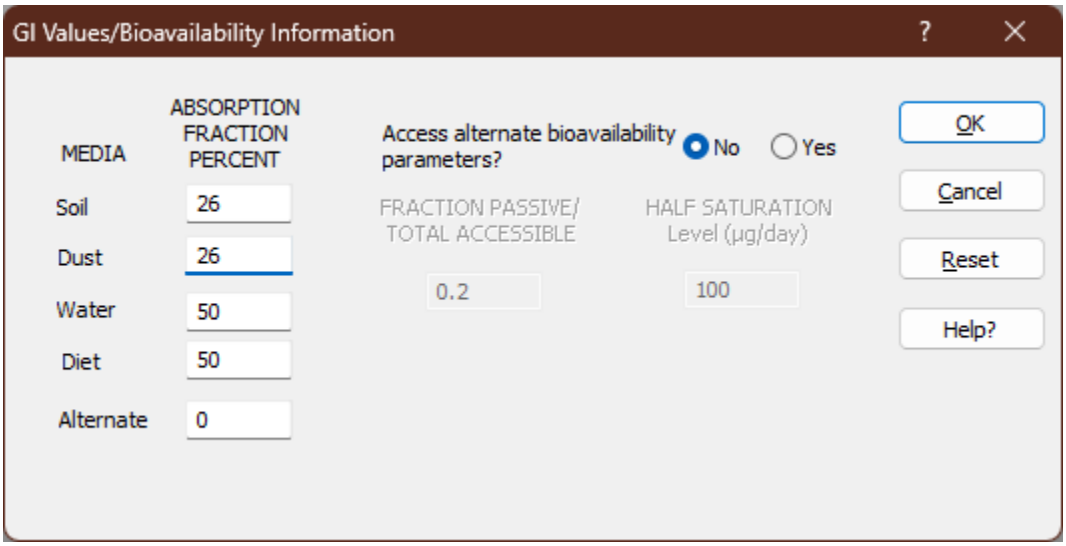

Figure 1. Screen shot of the GI Values/Bioavailability Information Input Window from the IEUBK Model (V2).

The default bioavailability assumption in the IEUBK model is that the bioavailability of lead in soil and dust are the same because the model assumes the majority of lead in indoor dust is derived from outdoor soil (i.e., the Mass Fraction of Soil to Dust [MSD] is 0.70). Where site-specific bioavailability data for soil is available, we recommend setting the dust Absorption Fraction Percent to the same value as soil. If the site team determines that characterizing the bioavailability of lead in dust samples is warranted (e.g., the site history indicates another non-soil source [or sources] of lead in dust which may result in a substantial difference between the bioavailability estimates for lead in dust as compared to soil), then the risk calculation may include the site-specific dust lead concentration and dust lead bioavailability information in the IEUBK model Gi/Bio data entry window.

The dietary absorption fraction percent is the average gastrointestinal absorption rate based on measurements among infants.

The water absorption fraction percent is based on bioavailability of lead acetate.

The alternate absorption fraction percent is based on default condition that there is no other source of lead ingestion in the household[1].

More detailed information, see the IEUBK technical support document (TSD; http://semspub.epa.gov/src/document/HQ/176287) and bioavailability guidance document (https://www.epa.gov/superfund/soil-bioavailability-superfund-sites-technical-assistance) concerning the IEUBK model and bioavailability information.

[1] See Table B-1, Description of Parameters in the IEUBK Lead Model in the IEUBK technical support document.