LeadSpread 9 - FREQUENTLY ASKED QUESTIONS

California Department of Toxic Substances Control (DTSC)
Human and Ecological Risk Office (HERO)
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1. **Why did the PRG for the Occupational Worker (Commercial/Industrial Scenario) receptor increase from 320 mg/kg to 499 mg/kg?**

   In LeadSpread 8, the occupational worker calculations were carried out on a separate worksheet based on the US EPA Adult Lead Model (ALM) with Cal EPA Exposure Parameters and using OEHHA's Benchmark Dose as a toxicity endpoint. The ALM is similar in structure to LeadSpread but has some features that are different. In LeadSpread 9, child and adult residential and occupational calculations are all carried out using the same worksheet and the occupational worker calculations are done using the LeadSpread format. The blood lead value predicted by LeadSpread is directly tied to the soil ingestion parameter. The updated US EPA adult soil ingestion value of 30 mg/day used in LeadSpread 9 is 40% less than the previous value of 50 mg/day used in LeadSpread. This means that 40% less soil and lead will be assumed to be ingested per day and the blood lead will be markedly lower. Less soil ingestion results in a rise in the PRG because the benchmark dose for lead will not be reached until the soil lead concentration increases to a level that accounts for the lower daily lead ingestion. Additionally, the lower Geometric Standard Deviation (GSD) of 1.6 in LeadSpread 9 compared to 1.8 in LeadSpread 8 predicts less variability in the receptor's blood lead allowing the PRG to rise. The difference between the US EPA ALM format and LeadSpread 9 format result in differences in the output if one were to compare the results for the occupational worker between the ALM and LeadSpread 9.

2. **LeadSpread 9 calculates a 90th percentile value of 1.0 µg/dL at 70 mg/kg. Why is the PRG for LeadSpread still listed at 80 mg/kg?**

   With Leadspread 9, the child's blood lead value is 1.1 µg/dL at 80 mg/kg soil lead concentration. The difference in predicted incremental blood lead and IQ change for exposures to soil lead between 70 mg/kg and 80 mg/kg is within the LeadSpread model uncertainty and does not reach the *de minimis* level of a 1 IQ point decrease. The blood lead value of 1.1 µg/dL would have to rise up to 1.5 µg/dL (which would round up to 2.0) to be considered a significant increase in blood lead levels.

3. **HERO's Human Health Note 1 lists default soil ingestion numbers as 100 mg/day for the adult and 200 mg/day for the child. Why does LeadSpread 9 use 30 mg/day for the adult and 80 mg/day for the child.**

   The soil ingestion numbers listed in Human Health Note 1 are upper bound numbers selected to be health protective. LeadSpread achieves health protection by utilizing central tendency (average values for the exposure parameters, including soil ingestion) and then computes a protective blood lead value based on the upper 90th percentile exposed receptor rather than the average receptor.

4. **Why was the GSD for the adult receptor changed to 1.6 in LeadSpread 9 from the value of 1.8 used in LeadSpread 8 and in US EPA's Adult Lead Model?**

   In LeadSpread 8, a separate worksheet was used for the adult and the adult was based on US EPA's Adult Lead Model which uses 1.8 as a GSD. In LeadSpread 9, the adult and child are calculated on the same spreadsheet and all calculations are performed using the Leadspread format. LeadSpread 9 calculates an incremental increase in blood lead coming from exposure to lead from the site only. The Adult Lead model calculates a blood lead based on exposure to all sources of lead including drinking water, food and non-site related soil and dust. LeadSpread does not include these sources and thus there is less variability in the calculation. This results in a lower GSD. US EPA's IEUBK model used by US EPA for modeling childhood lead exposure also uses a GSD of 1.6.

5. **Why did the relative bioavailability factor for lead change from 0.44 to 0.60?**

   The relative bioavailability factor increased from 0.44 to 0.60 to reflect the current US EPA recommendation. US EPA uses a default relative bioavailability factor of 0.60 in their Integrated Exposure Uptake Biokinetic (IEUBK) model.

6. **Were other exposure parameters revised in LeadSpread 9?**

   a. Yes, HERO updated the child inhalation rate from 6.8 m^3/day to 10 m^3/day. The updated child inhalation rate is consistent with current recommendations by US EPA and DTSC in our HHRA Note 1. The adult resident inhalation rate value is 20 m^3/day, and the adult occupational worker inhalation rate value is 14 m^3/day consistent with DTSC/HERO HHRA Note 1. The air pathway plays a minor role

in LeadSpread and accounts for site related soil that is re-suspended into the breathing zone by wind.

b. HERO updated the child skin surface area from 2900 cm^2 to 2373 cm^2. The change is based on the current child skin surface area recommendations from US EPA.

7. Where can I find information about the changes in the exposure parameters used in LeadSpread 9?

Under LeadSpread 9 in HERO's section of the DTSC website click on the link for "Information for Users". Detailed information about the exposure parameters used in LeadSpread 9 and rationale for any differences are presented.

8. Where can I find information about the content of the cells In the LeadSpread 9 spreadsheet cells?

Many of the cells contain notes which explain the cell content when the cursor is moved over them. Information on the spreadsheet can also be found by clicking on Users Guide to LeadSpread 9 at the bottom of the work sheet.

9. What exposure duration is used in the LeadSpread 9 model?

The exposure duration used in LeadSpread is a 90-day average.

10. What is an appropriate soil ingestion rate (IR) for a construction worker scenario to use in LeadSpread 9?

HERO recommends a value of 100 mg/day as a central tendency soil ingestion rate for a construction worker. This would be the value customarily entered into LeadSpread when evaluating the construction worker. If there will be high soil contact and/or blowing dust, a value of up to 200 mg/day may be used. If there is minimum of soil contact, 50 mg/day would be appropriate. Soil disturbing activities such as digging, irrigation installation, utility work, etc. may be considered under the construction worker scenario.

HERO's recommendation is based on guidance from US EPA in which they described a range of options for the construction worker soil ingestion rate as follows:

Central Tendency Soil Ingestion Parameter for a Construction Worker

"For construction workers and other soil contact-intensive occupations, EPA Office of Solid Waste and Emergency Response (OSWER) guidance recommends an upper bound value for IRs of 330 mg/day based on Stanek et al. (1997) ….

Because central tendency values are recommended inputs for both the IEUBK [Integrated Exposure Uptake Biokinetic] model and the ALM [Adult Lead Model], a more plausible range for a soil lead IR is 50 mg/day to 200 mg/day for adult contact-intense soil exposures. Thus, there is reasonable support for use of 100 mg/day as a soil ingestion rate for the contact-intense worker scenario in the ALM." US EPA (2022a)."

HERO notes that there is little soil ingestion data available for the construction worker which adds a level of uncertainty in selecting the soil ingestion rates. Further adding to the difficulty of finding a value for this parameter is the wide range of activities that fall into this category. There could be substantial soil contact, as for a trench worker or very limited as in an iron worker on a high-rise building. How to Calculate Blood Lead Level and a PRG for the Construction Worker using LeadSpread 9.

In cell 14C enter the days per week workers are exposed. The default value is 5 days/week. In cell 21C enter your selected value for soil ingestion, 50, 100 or 200 mg/day. The default value is 100 mg/day. In cell 8B enter the upper 95th percentile confidence limit on the mean value for the lead concentration for the site. Press the enter key and find the corresponding blood lead value and PRG listed in the occupational section (cells 11G through 11K).

References

Stanek EJ 3rd, Calabrese EJ, Barnes R, Pekow P. (1997). Soil ingestion in adults--results of a second pilot study. Ecotoxicol Environ Saf. Apr;36(3):249-57. doi: 10.1006/eesa.1996.1510. PMID: https://pubmed.ncbi.nlm.nih.gov/9143453/

US EPA (2022a). Lead at Superfund Sites: Frequent Questions from Risk Assessors on the Adult Lead Methodology (https://www.epa.gov/superfund/lead-superfund-sites-frequent-questions-risk-assessors-adult-lead-methodology)