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Poster: Risk Assessment II
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Physiologically Based Pharmacokinetic Modeling of the Impact of Intermittent Oral Exposures to Lead on Blood Lead Levels and Associated Health Risks.

Lead modeling has been used for many years to quantify the impact of lead intake on blood lead, bone lead, and other tissues in the body, in order to assess risks from lead exposure, as well as to set permissible levels for lead in environmental media. The International Commission on Radiological Protection (ICRP) model, also known as the Leggett model, is a well-regarded and validated physiologically based pharmacokinetic (PBPK) model for estimating blood lead levels resulting from oral or inhalation exposures. To investigate the potential health risks of various hypothetical lead exposure scenarios, we used the Leggett model to predict the quantitative impacts on blood lead associated with intermittent exposures to lead. We present here two case studies. First, we determined the geometric mean blood lead levels (averaged over a 1 year exposure period) where the probability of exceeding blood lead level targets (5, 10, 15 or 20 µg/dL) is <=5% (assuming a geometric standard deviation of 1.8 for adults). We then determined the intake values (e.g. micrograms of lead per intake event) for a given exposure frequency (e.g. every other day, 1 day/week) that would correspond with those geometric mean values over a one year exposure period. In our second case study, we determined the exposure frequency (e.g. daily, once every seven days) to a hypothetical lead contaminated candy for a given lead intake (e.g. 3 µg lead per eating occasion) at which resulting blood lead levels fall below those associated with consumption of the California Office of Environmental Health and Hazard Assessment (OEHHA) Proposition 65 Safe Harbor level, or maximum allowable dose level (MADL) of 0.5 µg of lead every day. Based on our evaluation of these hypothetical scenarios, we concluded that 1)daily point estimates associated with intermittent lead exposures are dependent on exposure frequency, 2) blood lead levels averaged over time are more dependent on total lead intake over a given time period than exposure frequency, and 3) modeling blood leads associated with intermittent exposures allows for evaluation of Proposition 65 compliance.