

## Uncertainty Analysis on Lung Doses for US Nuclear Workers

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The United States Transuranium and Uranium Registries (USTUR) is a unique resource of data from US nuclear workers with known histories of internal actinide (mainly plutonium, uranium, and americium) contamination. Currently, extensive sets of data including radiation exposure records, bioassay measurements, medical histories, and post-mortem tissue analysis results are available in the Registries for 300+ deceased tissue donors [1]. These data are broadly used to refine internal dose assessment methods as the bases of credible standards for radiological protection. Inhalation is the most common pathway of internal contamination for nuclear workers. Hence, accurate assessment of absorbed doses to the radiosensitive tissues of the respiratory tract is important for better understanding of health effects caused by inhaled radionuclides. Recently published results of uncertainty analysis for European radiation workers using Bayesian analysis methods [2] demonstrated that the uncertainties on lung absorption parameters had a dominant effect on the uncertainties on lung doses and indicated the need for further research for a better determination of parameter values for a sizable variety of potential inhalation scenarios. A similar approach was adapted in this study for the USTUR Registrants exposed to plutonium via inhalation. The Weighted Likelihood Monte-Carlo Sampling (WeLMoS) method, as implemented in IMBA Uncertainty Analyzer software tool [3], was applied to the bioassay and autopsy data from the USTUR donors to evaluate the lung doses, calculate the associated uncertainties expressed by Bayesian posterior probability distributions, and derive the material-specific sets of lung absorption parameters for further use in epidemiologic studies. Objectives and design of this study along with the preliminary results are discussed.

### References:

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- [3] Puncher M, Birchall A. A Monte Carlo method for calculating Bayesian uncertainties in internal dosimetry. *Radiat Prot Dosim* 132(1): 1-12; **2008**

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