Validation of a System of Models for Plutonium Decorporation Therapy

Sara Dumit[1,2], Maia Avtandilashvili[1], Stacey L. McComish[1], Daniel J. Strom[1], George Tabatadze[1]

[1]United States Transuranium and Uranium Registries, Washington State University, Richland, WA; [2]Los Alamos National Laboratory, Los Alamos, NM

A recently proposed system of models for plutonium decorporation (SPD) was developed using data from an individual occupationally exposed to plutonium via a wound [from United States Transuranium and Uranium Registries (USTUR) Case 0212]. The present study evaluated the SPD using chelation treatment data, urine measurements, and post-mortem plutonium activities in the skeleton and liver from USTUR Case 0269. This individual was occupationally exposed to moderately soluble plutonium via inhalation and extensively treated with chelating agents. The SPD was linked to the International Commission on Radiological Protection (ICRP) Publication 66 Human Respiratory Tract Model (HRTM) and the ICRP Publication 30 Gastrointestinal Tract model to evaluate the goodness-of-fit to the urinary excretion data and the predictions of post-mortem plutonium retention in the skeleton and liver. The goodness-of-fit was also evaluated when the SPD was linked to the ICRP Publication 130 HRTM and the ICRP Publication 100 Human Alimentary Tract Model. The present study showed that the proposed SPD was useful for fitting the entire, chelation-affected and non-affected, urine bioassay data, and for predicting the post-mortem plutonium retention in the skeleton and liver at time of death, 38.5 years after the accident. The results of this work are consistent with the conclusion that Ca-EDTA is less effective than Ca-DTPA for enhancing urinary excretion of plutonium.

USTUR-0500A-18