

## **Metabolism and Dosimetry of Actinide Elements in Occupationally Exposed Personnel of Russia and the United States: A Summary Progress Report**

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The United States Transuranium and Uranium Registries (USTUR) and the Dosimetry Registry of the Mayak Industrial Association (DRMIA) have been independently collecting tissues at autopsy of plutonium workers in their respective countries for nearly 30 years. The tissues are analyzed radiochemically and the analytical data are used to develop, modify or refine biokinetic models that describe the depositions and translocations of plutonium and transplutonium elements in the human body. The purpose of this collaborative research project is to combine the unique information on human, gathered by the two Registries, into a joint database and perform analyses of the data. A series of project tasks are directly concerned with dosimetry in Mayak workers and involve biokinetic modeling for actinide elements. Transportability coefficients derived from in-vitro solubility measurements of actinide-containing aerosols (as measured by the DRMIA) were related to specific workplaces within Mayak facilities. The transportability coefficients of inhaled aerosols significantly affected the translocation rates of plutonium from the respiratory tract to the systemic circulation. Parameters of a simplified lung model, used by Branch No. 1, Federal Research Center Institute of Biophysics (FIB-1) and the Mayak Production Association for dose assessment at long time after inhalation of plutonium-containing aerosols, were developed on the bases of joint USTUR and DRMIA data. This model has separate sets of deposition and transfer parameters for three aerosol transportability groups, allowing work histories of the workers to be considered in the dose-assessment process. FIB-1 biokinetic models were extended to include the distributions of actinide elements in systemic organs of workers, and a relationship between the health of individual workers and plutonium distribution in tissues was determined. Workers who suffered from liver diseases generally had a smaller fraction of systemic plutonium in the liver at death and a larger fraction in the skeleton than did relatively healthy workers. Also, the fraction of total systemic plutonium excreted per day was significantly greater for workers with liver diseases than for relatively healthy workers. These observations could have a considerable effect on organ dosimetry in health-impaired workers whose dose assessments were based solely on urinary excretion rates. A comparison of this model to other biokinetic models, such as those published by the International Commission for Radiological Protection is currently underway as is the documentation of uncertainty estimates associated with the model.