

## **Plutonium in Rocky Flats Workers: Using Post-mortem Tissue Analyses to Evaluate Organ Content and Dose Estimates Based on Monitoring Data**

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Radiation epidemiology typically relies on dose predictions based on bioassay monitoring data, most commonly, in-vitro urinary excretion measurements and, in some cases, in-vivo examinations of the whole body or organ activities. At the United States Transuranium and Uranium Registries (USTUR), bioassay data and post-mortem tissue radiochemical analyses are used for actinide biokinetic modeling and estimation of radiation doses. To evaluate uncertainties in radiation dose estimates from internally deposited <sup>239</sup>Pu, a group of 25 former nuclear workers from Rocky Flats Plant was selected from the USTUR health physics database. The selected workers had at least 5 positive urine samples (more than the contemporary minimum detectable activity) and did not undergo an extensive chelation treatment. A preliminary analysis was performed on nine individuals from the group exposed to 'high-fired' PuO<sub>2</sub> aerosols in the same incident. For six workers, this was the only intake, for three others, an additional wound intake was considered. The measured <sup>239</sup>Pu activities were between 9.4 and 123 Bq in the liver, between 9.2 and 215 Bq in the skeleton, and between 92.9 and 7,540 Bq in the lungs. Post-mortem activities in the lungs and liver+skeleton were compared to the predictions based on bioassay measurements (urine, chest counts). For the liver+skeleton, the predicted activity was on average 40.7% higher than the measured activity; for the respiratory tract, the predicted activity was on average 16.2% lower than the post-mortem measurements. Committed effective doses (E50) calculated using only bioassay data were compared to the doses calculated using bioassay together with post-mortem tissue analysis results (liver+skeleton and lungs). The results show that using post-mortem tissue analysis results increased the estimated E50 on average only by 4.2%.

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