Uranium Content, Distribution, and Biokinetics in Human Body: USTUR Studies

Maia Avtandilashvili[1], Sergey Tolmachev[1]

[1]*United States Transuranium and Uranium Registries, Washington State University, Richland, WA*

Since 1968, the United States Transuranium and Uranium Registries (USTUR) has followed up occupationally-exposed individuals (volunteer tissue donors) by studying biokinetic and dosimetry of actinide elements. The USTUR currently holds data and tissue samples from six whole- and 38 partial-body donors with occupational uranium intakes. In this study, uranium tissue concentrations, body distribution, and biokinetics were compared between a group of individuals (two males and one female) with occupational exposure to uranium and a group with chronic environmental-only intakes (three males).

Of three occupationally-exposed individuals, one had chronic inhalation intake of uranium oxide with natural composition, another had acute inhalation of slightly enriched UF_6, and the third (female) had both chronic and acute inhalation of highly enriched U_3O_8. For all six individuals, the skeleton was a major deposition site where 55 ± 17% of systemic uranium was retained at the time of death. The geometric mean concentration in the skeleton was 4.1 $\mu g \cdot kg^{-1}$ with a geometric standard deviation of 1.7. Systemic uranium was equally distributed between the skeleton and soft tissues. For five male cases, uranium content in systemic organs followed the pattern: skeleton >> spleen $\approx$ kidneys > liver $\approx$ brain > heart $\approx$ thyroid. For a single female case, the pattern was: skeleton >> brain $\approx$ kidneys > heart $\approx$ liver > thyroid $\approx$ spleen. For U_3O_8 inhalation, approximately 40% of occupational uranium was still retained in the skeleton, followed by the kidneys (~30%), and the brain and liver (~10%) 31 years after exposure. For UF_6 inhalation, 65 years post-intake, approximately 40% of occupational uranium was retained in the brain, followed by the liver (~26%), and the skeleton (~21%) and kidneys (~7%).

USTUR-0667-24A