USTUR: Expanding horizons for actinide biokinetics and dosimetry

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Abstract

Since 1968, the U.S. Transuranium and Uranium Registries (USTUR) follows up occupationally-exposed individuals (volunteer Registrants) by studying the biokinetics (deposition, translocation, retention, and excretion) and tissue dosimetry of actinide elements [1].

The USTUR holds data on work history, radiation exposure and bioassay measurements, as well as medical records from more than 400 former nuclear workers. These individuals had documented intakes of actinides at the levels higher than 74 Bq. Inhalation and wound are two major routes of intake and ^{239}Pu is a primary radionuclide of exposure (Fig. 1.).

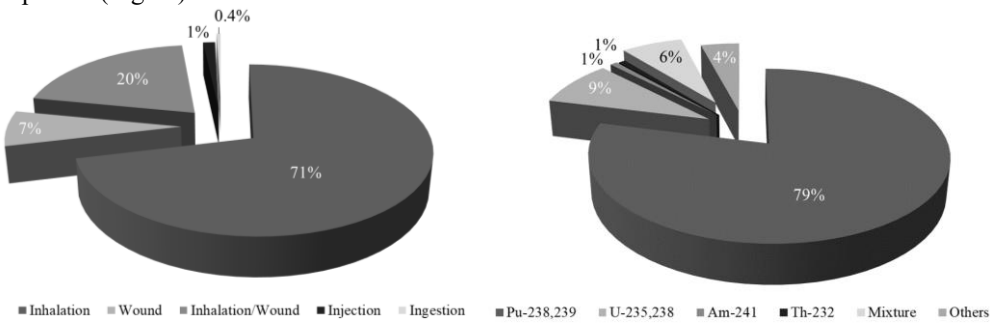

Fig. 1. USTUR Registrants' exposure by: route of intake (left) and primary radionuclide (right).

Post-mortem radiochemical analyses of tissues obtained at autopsy, especially those from the whole-body donors, allows USTUR significantly improve our knowledge on distribution and long-term retention of actinides in the human body and have helped in parameterizing biokinetic constants for these radioactive elements.

Recently, several groups of individual cases have identified to study biokinetics and dosimetry for specific radionuclides, exposure scenarios and materials, as well as effects of decorporation treatment (Table 1).

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Table 1. USTUR specific study groups.

Study group	Number of cases
^{239}Pu	
Soluble	14
Refractory	22
^{238}Pu	10
^{241}Am	3
Uranium	
Enriched	5
Depleted	3
Natural	17
^{232}Th	3
^{237}Np	1
^{244}Cm	1
^{239}Pu wound	14
Decorporation	
^{239}Pu	14
^{238}Pu	1
^{241}Am	2

The data from USTUR whole-body donor who was exposed to soluble ^{239}Pu via inhalation were used to study long-term plutonium retention in the upper airways and quantify plutonium 'bound' fraction [2, 3]. This is only one eminent example how the USTUR data can be used to improve the accuracy of dose assessment and radiation protection of plutonium workers.

References

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