# USTUR: Expanding horizons for actinide biokinetics and dosimetry

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## Abstract

Since 1968, the U.S. Transuranium and Uranium Registries (USTUR) has followed up with 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 (Fig. 1.)

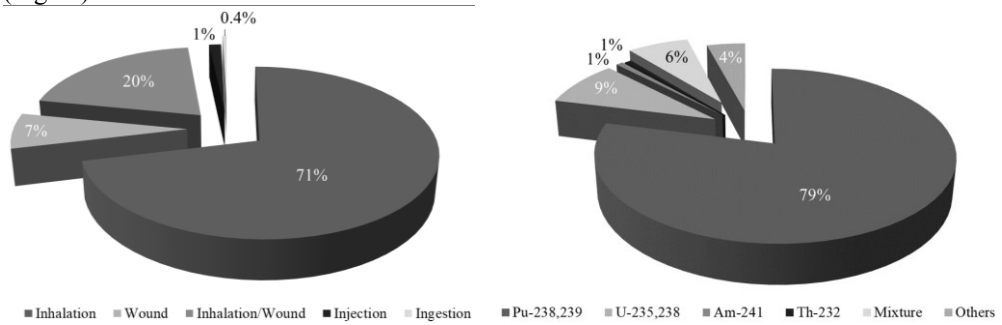


**Fig. 1.** USTUR Registrants' exposure by: route of intake (left) and primary radionuclide (right).

Post-mortem radiochemical analyses of tissues obtained at autopsy, especially those from the whole-body donors, allows USTUR to significantly improve our knowledge of 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 been identified for studying 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 |

Data from a 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 the plutonium 'bound' fraction [2, 3]. This is only one notable example of the manner in which USTUR data can be used to improve accuracy of dose assessment and radiation protection of plutonium workers.

## References

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