

Comparison of Dose Estimation from Occupational Exposure to ²³⁹Pu Using Different Modelling Approaches

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Several approaches are available for bioassay interpretation when assigning Pu doses to Mayak workers. First, a conventional approach is to apply ICRP models per se. An alternative method involves individualised fitting of bioassay data using Bayesian statistical methods. A third approach is to develop an independent dosimetry system for Mayak workers by adapting ICRP models using a dataset of available bioassay measurements for this population. Thus, a dataset of 42 former Mayak workers, who died of non-radiation effects, with both urine bioassay and post-mortem tissue data was used to test these three approaches. All three approaches proved to be adequate for bioassay and tissue interpretation, and thus for Pu dose reconstruction purposes. However, large discrepancies are observed in the resulting quantitative dose estimates. These discrepancies can, in large part, be explained by differences in the interpretation of Pu behaviour in the lungs in the context of ICRP lung model. Thus, a careful validation of Pu lung dosimetry model is needed in Mayak worker dosimetry systems.

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