

The Microdistribution and Long-Term Retention of Plutonium Nitrate in the Respiratory Tracts of an Acutely Exposed Plutonium Worker and Experimental Beagle Dogs

Christopher E. Nielsen¹, Dulaney A. Wilson¹, Antone L. Brooks¹, Stacey L. McCord², Gerald E. Dagle³, Anthony C. James², Sergei Y. Tolmachev², Brian D. Thrall¹ and William F. Morgan¹

¹*Biological Sciences Division, Pacific Northwest National Laboratory, Richland, WA;* ²*United States Transuranium & Uranium Registries, College of Pharmacy, Washington State University, Richland, WA;* ³*Retired*

The distributions of long-term retained soluble plutonium nitrate [²³⁹Pu (NO₃)₄] deposited in the lungs of an accidentally exposed nuclear worker (Human Case 0269) and in the lungs of experimentally exposed beagle dogs with varying initial lung depositions were determined via autoradiography of selected histological lung, lymph node, trachea, and nasal turbinate tissue sections. Human Case 0269 had an estimated intake of 58kBq. Bioassay and radiochemistry data indicated that 2% of the initial deposit remained bound in the tissues at the time of death.

These studies showed that both the human and dogs had a non-uniform distribution of plutonium (Pu) throughout the respiratory tract. Fibrotic scar tissue effectively encapsulated a portion of the Pu and prevented its clearance from the body or translocation to other tissues and diminished dose to organ parenchyma. Alpha radiation activity from deposited Pu in Human Case 0269 was observed primarily along the pleura. In both the human case and beagle dogs, the appearance of retained Pu within the respiratory tract was inconsistent with current biokinetic models of clearance for soluble forms of Pu.

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