

## Inhalation of Highly Insoluble Pu: Case Studies from the Rocky Flats Pu Fire

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The United States Transuranium and Uranium Registries (USTUR) includes several whole- and partial-body donations from workers involved in the Rocky Flats Plutonium fire in 1965. This fire resulted in Pu contamination over about 6,500 m<sup>2</sup> of working area with airborne Pu concentrations ranging from 3.7×10<sup>-2</sup> Bq/m<sup>3</sup> to greater than 3.7×10<sup>4</sup> Bq/m<sup>3</sup>. About 400 workers were monitored for their potential exposure to highly insoluble “high fired” plutonium dioxide particles (with a measured mass median physical particle diameter (MMD) of 0.32 micrometer). Several of the employees had intakes exceeding the contemporary permissible lung burden of 592 Bq (16 nCi) by a factor of 1 to 17. The USTUR’s follow-up of relatively highly exposed individuals over several decades indicates that the inhaled plutonium is retained in the lungs significantly longer than expected for insoluble “Type S” plutonium [as characterized by the International Commission on Radiological Protection’s (ICRP) Publication 66 Human Respiratory Tract Model (HRTM)]. This phenomenon has been referred to as “Type Super S” absorption behavior, although the mechanism for this very long particle retention has not yet been established. Several cases with long follow-up and minimal influence of additional exposures were selected from the USTUR database. These were used to evaluate simultaneously the intake amounts, lung absorption rates and long-term particle transport (clearance) rates from the lungs, with their associated uncertainty distributions. The results are discussed.

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