

## **Long-term Retention of Plutonium in the Respiratory Tract Compartments: Arguments Against Chemical Binding**

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The radiation dose imparted by plutonium to the respiratory tract depends on the residence time and location of plutonium within the respiratory tract. The Human Respiratory Tract Model provides some mechanisms to account for the long-term retention of inhaled plutonium. One of these mechanisms is 'binding', which refers to a process by which a fraction (the 'bound fraction') of the dissolved material chemically binds to the tissue of the airway wall. The ICRP Publication 141 recommends a bound fraction of 0.2% for plutonium based on the results of two human and one animal studies. An evaluation of these studies, however, indicates that they do not provide direct evidence for chemical binding. Instead, their findings strongly suggest a different mechanism for long-term retention. Chemical binding alone is unable to explain post-mortem data on regional retention of plutonium in occupationally exposed individuals from the United States Transuranium and Uranium Registries (USTUR). Moreover, in contrast to the ICRP framework of binding, the calculated values of bound fraction are found to be dependent on the solubility of the material inhaled. In addition to discussing these and other inconsistencies of the chemical binding model, this presentation also explores more plausible mechanisms of plutonium retention in the respiratory tract using data from the USTUR whole-body tissue donor with a wound intake, as well as several animal studies.

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