

Evaluation of Carcinogenic Risk of Depleted Uranium in the Lungs of Gulf War Veterans*

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The aim of this work was to determine the burden of inhaled depleted uranium (DU) oxide particles in the lungs of British, Canadian, and US Gulf War I veterans at time-zero of exposure. In a group of thirteen veterans whose urine was quantitatively analyzed for DU isotopes by thermal ionization mass spectrometry (TIMS) nine years after exposure, five tested positive for the presence of DU. Our method presents a new, non-invasive technique for calculating a cumulative alpha-particle radiation dose from DU isotopes in the lungs of exposed veterans. We have utilized a method of determining the minimum biological half-life of DU from the derivation of the Battelle Model of simulated interstitial lung fluid. The values of the minimum biological half-life determined the total inhalational exposure to DU isotopes at time-zero. The integration of the total number of alpha particle events from time-zero to ten years after exposure has been calculated as a radiation dose. The average of 24-hour urine specimens of veterans containing 3.89×10^{-2} micrograms (μg) of DU corresponds to inhalational exposure of 0.34 milligrams (mg) of DU at time-zero with an alpha radiation dose to the lungs of 1.14 milliSieverts (mSv) during the first year and a total of 5.77 mSv over ten years. The determined values slightly exceed the maximum permissible inhalational dose of uranium and suggest a need for additional research on metabolic pathways, biological half-life, and DU induced risk of malignant alterations in the respiratory system of the exposed population.

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