

QUANTITATIVE ANALYSIS OF URANIUM ISOTOPES IN CANADIAN, US, AND BRITISH GULF WAR VETERANS

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The purpose of this study was to determine the concentration and ratio of Uranium isotopes in the urine and organs of the Gulf War Veterans exposed to depleted Uranium (DU) by the inhalational route of internal contamination.

Sixteen Canadian, US, and British veterans presenting with complex non-specific clinical symptomatology of the Gulf War Illness had their 24 hrs urine samples quantitatively determined for ^{234}U , ^{235}U , ^{236}U , and ^{238}U by the method of mass spectrometric analysis. The urine samples were collected and transported under controlled circumstances in sealed plastic vials, weighed into Savillex-Teflon screw-cap jars (15ml) and evaporated to dryness at 80-100 degrees C. All samples were repeatedly evaporated three times after the addition of 4ml of double distilled concentrated nitric acid. Each sample was separated into an isotopic concentration and isotopic dilution fraction, by adding 3.1N hydrochloric acid to each sample. Half of each sample was transferred to the Savillex-Teflon jar (7ml) and accurately weighed. Uranium was separated and collected in both fractions after ion exchange preparation with DOWEX analytical grade AGL-X8 ion exchange resins with a modified HBr technique. The isotopic composition was measured by a multi-collector Finnigan MAT 262 thermal ionization mass spectrometer using secondary electron multiplier (SEM) detector and ion counting system. The Uranium blank control has been determined to be 0.45 picograms and ^{960}U standard, measured by the same procedure.

The isotopic composition indicated the presence of DU in 9/16 samples (^{238}U >99.5%, ^{235}U <0.45%) with the average ratio of $^{238}\text{U}/^{235}\text{U}$ >244.4, ^{234}U >0.0042 and a definitive presence of ^{236}U >0.0058 percent.

Autopsy specimens of the liver, lung, and bone tissue were analyzed in one deceased veteran. Whereas lung and liver contained values of natural uranium, the bone sample contained the percentages and ratios of DU (147.5-148.1) with a definite presence of ^{236}U .

The results demonstrate a significant presence of DU in the urine samples and skeletal tissue of the Gulf War Veterans nine years after inhalational exposure and warrants further investigation.

[keywords]

Depleted Uranium; Radionuclide Contamination

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