

The Bioassay of Uranium Isotopes in the Civilians of Baghdad and International Research Team Members after Operation Iraqi Freedom*

Asaf Durakovic†, Axel Gerdes‡, Frank Klimaschewski†

The purpose of this study was to determine the concentration and precise isotopic ratios of four uranium isotopes (^{234}U , ^{235}U , ^{236}U , ^{238}U) in the urine specimens of both research team members and civilians of Baghdad following Operation Iraqi Freedom.

The study included seven symptomatic civilians from the Baghdad area exposed to aerial bombings and tank battles. The subjects' most common symptoms included fatigue, intermittent fever, respiratory impairment, nocturnal diaphoresis, headaches, musculoskeletal pains, urinary tract alterations, and affect disorders. Urine samples were collected by three Uranium Medical Research Centre field team members. Their urine was also collected and analyzed. The urine specimens were analyzed at the Institute for Mineralogy, J.W. Goethe University using double-focusing Thermo Finnigan Neptune multi-collector ICP-MS. The analytical methodology included preconcentration of urine samples using co-precipitation, oxidation of organic matter, uranium purification by ion-exchange chromatography, and mass spectrometry analysis. Data errors were calculated with the consideration of uncertainty of all applied corrections and reproducibility of the reference solution.

The mean concentration of total uranium in all samples was found to be 23.06 ng/L and 21.02 ng/L in the team members. This is within normal limits for the international standard uranium concentration in urine. Six samples from Baghdad had natural ^{238}U : ^{235}U isotopic ratio of 138.31. The urine of one Baghdad civilian (142.71) and three samples of the research team members contained depleted uranium (140.1). The ^{234}U : ^{238}U ratio of the civilians was 7.20×10^{-5} whereas the ratio of the team members was 6.61×10^{-5} . The ^{236}U : ^{238}U ratio of the civilians (6.74×10^{-7}) indicates a presence of ^{236}U in at least three of seven samples. The presence of ^{236}U was found in two of three research team members (5.49×10^{-7}).

Our results demonstrate the presence of depleted uranium in both the civilians of Baghdad after Operation Iraqi Freedom and the members of the UMRC research team. The cause of the urinary presence of depleted uranium may be consistent with our previously reported findings of DU contamination of the Allied Forces veterans in Gulf War I, by inhalation of DU containing aerosols.

* Croatian Society of Nuclear Medicine, Opatija, Croatia, May 15 - 18, 2005

† Uranium Medical Research Centre

‡ Institute for Mineralogy, JW Goethe University, Frankfurt, Germany