The Quantitative Analysis of Uranium Isotopes in the Civilian Population of Gaza by the Alpha Spectrometry

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Purpose:

The altered ratio of uranium isotopes in the civilians of Lebanon (2006) and Gaza (2009) after the use of guided weapons in the recent military conflicts has been reported in the range of enriched uranium (ECRR No2 Brussels 2010). The purpose of our study was to analyze the presence of enriched or depleted uranium in the biological specimens of the civilian population of the Gaza Strip.

Materials and Methods:

The field team of the Uranium Medical Research Center (UMRC) was deployed in the Gaza Strip after Operation Cast Lead (December 2008 – January 2009). Ten subjects from Gaza City, Rafa, Beit Lahia and Jabaliya were selected on the basis of their exposure history to the post-conflict dust and the standard profile symptoms. The collection of 24 hour urine samples have been analyzed for the uranium isotopes (^{234}U, ^{235}U, ^{238}U) at the laboratories of the Harwell Science Center, United Kingdom by the method described in HS/GWI/2055. The urine samples were digested for three hours after addition of nitric acid, calcium chloride carrier and a yield tracer. The uranium was co-precipitated on a Calcium/Magnesium phosphate precipitate which was filtered and ashed in a muffle furnace. The residue was dissolved in hydrochloric acid, aluminum nitrate and hydrolysed to orthophosphates, passed through anion exchange column as a chloride. The column was washed with hydrochloric and nitric acid, uranium eluted with nitric acid and evaporated to dry. The residue was dissolved in sulphuric acid, the pH adjusted and the uranium electrodeposited onto a stainless steel discs for alpha spectrometry.

Results:

The results were expressed in Bq/ L-1. The minimum reporting levels are 2mBQ/24 hours. The measured peaks for U-234, U-235, and U-238 were 4.776, 4.395, and 4.196 MeV respectively. The analysis was carried out with reagent blank, spiked with U-232 tracer solution. U-236 (4.494 MeV) could not be accurately measured by this method because of the proximity of U-234 and U-235 peaks. Our results indicate the ranges of <1 - <7 for U-234, U-235, and U-238 (mBq/L-1), with mass-metric equivalents of U-234=437*10-3 ng/L. U-235=12.6ng/L. U-238 =81.1ng/L as an estimated value.

Conclusions:

Our results do not suggest the presence of either manmade uranium or depleted uranium in the urine samples of Gaza Strip civilians following the recent military conflicts of 2008/2009. The fiscal advantage of the radiochemical and alpha spectrometry analysis does not provide the alternative to the sensitivity and specificity of inductively coupled plasma mass spectrometry. Further studies of the uranium isotopes not present in nature are warranted.