The analysis of the uranium isotopes abundance and ratios in the civilian population of the different regions of Iraq as a consequence of the use of radioactive weapons in Gulf War II (Operation Iraqi Freedom, OIF)

A. Durakovic, MD, Ph.D. (1), A. Gerdes, Ph.D. (2), F. Klimaschewski Ph.D. stud. (3), I. Zimmerman B.Sc.(4)
(1) Uranium Medical Research Centre, Washington, DC, USA
(2) Institute of Petrology and Geochemistry, JW Goethe University, Frankfurt, Germany
(3) Uranium Medical Research Centre, London, UK
(4) Uranium Medical Research Centre, Toronto, Canada, www.umrc.net

PURPOSE

The purpose of this work was to determine the concentration and precise ratios of four uranium isotopes (234U, 235U, 236U, 238U) in the urine specimens of the civilian population of different regions of Iraq as a consequence of the use of radioactive weapons in Gulf War II (Operation Iraqi Freedom, OIF).

PATIENTS, MATERIALS AND METHODS

7 symptomatic civilians were chosen from northern Iraq's 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.

Further 12 symptomatic Iraqi civilians from southern Iraq were selected from similar sites of aerial bombings or tank battles in the cities of Nasiriyah and Al Basra.

Urine samples were collected by Uranium Medical Research Centre (UMRC) field team members.

Measurement of Isotopic Composition

The urine specimens were analyzed using double-focusing Thermo Finnigan Neptune multi-collector ICP-MS. The analytical methodology included pre-concentration 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.

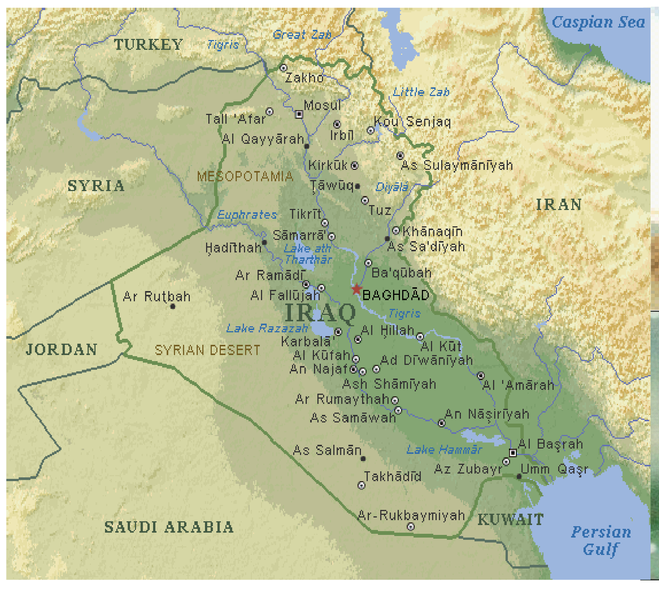
Results from northern Iraq:
The mean concentration of total uranium in all samples from Baghdad area is found to be 23.06 ng/L. Six samples from Baghdad have a natural 238U:235U isotopic ratio of 138.31 . The urine of one Baghdad civilian (142.71) contains depleted uranium (140.1). The 234U:238U ratio of these civilians is 7.20 x 10-5. The 236U:238U ratio of the civilians (6.74 x 10-7) indicates a presence of 236U in at least 3 of 7 samples.

Results from southern Iraq:
Seven samples urine samples show a natural 238U:235U ratio of 138.2 +/- 1.4. Five samples show a depleted 238U:235U ratio of 142.5 +/- 1.1. The mean concentration of total uranium is 32.0 +/- 24.6 ng/L in DU positive subjects and 25.2 +/- 18.0 ng/L in DU negative subjects. The mean 234U:238U ratio is 6.56 x 10-5 +/- 1.16 x 10-5 in DU positive subjects and 6.82 x 10-5 +/- 3.91 x 10-6 in DU negative subjects. There is a significant presence of 236U in all DU positive subjects with a mean 236U:238U ratio of 7.69 x 10-7. There is no detectable 236U in DU negative subjects. Recently reported first-time findings of 236U in natural uranium show that the 236U:238U ratio can be (10-10 to 10-14).

CONCLUSION

Our results demonstrate the presence of depleted uranium in civilians of northern and southern Iraq after Operation Iraqi Freedom (OIF). The cause of the urinary presence of depleted uranium and 236U may be consistent with our previously reported findings of DU contamination of the Allied Forces veterans in Gulf War I, natural uranium (NU) contamination of Afghanistan civilians after Operation Enduring Freedom (OEF), and the contamination of United States Gulf War II soldiers by inhalation of depleted uranium and non-depleted uranium containing aerosols. Our current investigations of critical evaluation of biological specimens and environmental samples are in progress.

Map of Iraq



Pictures 1 & 2

120mm DU Anti-tank Long Rod Penetrator

Table 1
Urine Samples of Iraqi Civilians
(Norther Iraq)

Samples	238U/235U	2 Sigma	234U/238U	2 Sigma	236U/238U	2 Sigma
1	138.85	0.78	7.21 x 10-5	2.06 x 10-6	< 1 x 10-7	
2	137.64	0.89	7.01 x 10-5	3.41 x 10-6	< 1 x 10-7	
3	**142.71**	0.64	6.90 x 10-5	3.82 x 10-6	**1.28 x 10-6**	6.95 x 10-8
4	137.79	0.46	7.51 x 10-5	1.79 x 10-6	< 1 x 10-7	
5	139.14	0.58	7.02 x 10-5	3.28 x 10-7	**3.92 x 10-7**	4.76 x 10-8
6	138.22	0.74	7.09 x 10-5	2.51 x 10-6	< 1 x 10-7	
7	138.19	1.27	7.48 x 10-5	2.92 x 10-6	**3.50 x 10-7**	3.37 x 10-7
Average	**138.93**		**7.18 x 10-5**		**3.46 x 10-7**	
StdDev	1.75		2.38x10-06		4.57x10-07	
StdErr	0.66		0.9x10-06		1.73x10-07	

Table 2
Urine Samples of Iraqi Civilians
(Southern Iraq)

Sample	238U/235U	2 Sigma	234U/238U	2 Sigma	236U/238U	2 Sigma
1	137.90	0.49	6.27 x 10-5	6.27 x 10-7	< 4 x 10-8	
2	147.22	0.75	6.71 x 10-5	6.47 x 10-7	9.61 x 10-8	1.91 x 10-8
3	137.95	0.49	6.34 x 10-5	6.01 x 10-7	< 4 x 10-8	
4	140.91	1.15	6.72 x 10-5	3.40 x 10-6	7.19 x 10-7	4.43 x 10-7
5	139.39	2.93	7.37 x 10-5	3.03 x 10-5	< 1 x 10-7	
6	146.45	1.55	5.90 x 10-5	7.03 x 10-6	2.36 x 10-6	9.38 x 10-7
7	138.89	0.35	6.14 x 10-5	1.29 x 10-6	3.54 x 10-7	7.48 x 10-8
8	138.02	0.33	6.20 x 10-5	2.16 x 10-6	< 1 x 10-7	
9	138.24	1.70	7.30 x 10-5	2.40 x 10-6	< 1 x 10-7	
10	139.24	1.14	7.36 x 10-5	3.66 x 10-6	2.92 x 10-7	4.51 x 10-7
11	137.63	1.02	7.16 x 10-5	2.36 x 10-6	< 1 x 10-7	
12	138.22	0.74	7.09 x 10-5	2.51 x 10-6	< 1 x 10-7	
Average	140.01		6.71 x 10-5		7.69 x 10-7	
Std Dev	3.32		5.33 x 10-6		9.31 x 10-7	

Table 3
Total Uranium Concentrations
(Urine Samples of Iraqi Civilians)
(Norther Iraq)

Sample	U ng/l
1	21.70
2	13.10
3	40.60
4	29.30
5	27.60
6	13.10
7	16.00
Average	**23.06**
StdDev	10.14

Table 4
Total Uranium Concentrations
(Urine Samples of Iraqi Civilians)
(Southern Iraq)

Sample	U ng/L
1	33.27
2	65.33
3	57.34
4	22.14
5	01.07
6	09.40
7	50.16
8	16.86
9	21.19
10	12.82
11	32.56
12	14.11
Average	28.02
Std Dev	20.21

Picture 3
Thermo Finnigan Neptune multi-collector
I CP-MS