

Uranium Isotopes Induced Alterations in the Human Genetic Pool as the First Indicator of Contamination after Operation Iraqi Freedom (OIF), Gulf War II and Enduring Freedom (OEF)



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INTRODUCTION

The purpose of this series of studies is the quantitative analysis of the concentration and ratio of four uranium isotopes ^{234}U , ^{235}U , ^{236}U , and ^{238}U in the soil and water after Operation Iraqi Freedom (OIF) during Gulf War II and operation Enduring Freedom (OEF) in Afghanistan. Another aspect of this research was to conduct an initial analysis of chromosomal instability in returning military personnel and the mutagenic effects after military conflicts in Iraq and Afghanistan.

METHODS

Soil, dust, debris, as well as drinking water were collected. Soil fine-fractions (< 150 micrometers), corresponding to 6 to 50% of the total samples, were separated and leached in hot aqua regia, leaving most of the natural uranium behind in undissolved minerals. The uranium fraction was purified by ion-exchange chromatography and analyzed by a double-focusing multicollector ICPMS Neptune. Genetic aberrations testing (SKY) was performed on seven symptomatic Gulf War veterans returning from Iraq whose twenty-four hour urine analysis showed contamination with uranium isotopes above normal levels.

RESULTS

(1) The concentration and ratio of uranium isotopes in the fine-fraction of surface soil from Baghdad and Basra collected after Operation Iraqi Freedom varies from about 1 to 2,600 mg/kg and is positively correlated with the ^{238}U : ^{235}U ratio, which ranges from 139.3 to 542.1. (2) Uranium isotopic levels in the soil samples from the bombsites of East Afghanistan showed values two to three times higher than worldwide concentration levels of 2 to 3 mg/kg and significantly higher concentrations in water than the World Health Organization maximum permissible levels. (3) SKY testing of the contaminated, symptomatic military personnel returning from Iraq were positive for genetic alterations.

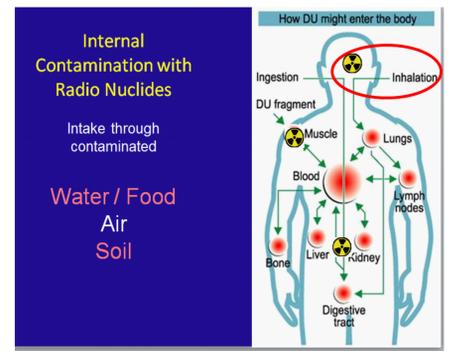
DISCUSSION

Our results demonstrate the presence of four uranium isotopes in the soil and water samples from Iraq and Afghanistan. The genetic aberrations found in contaminated, symptomatic military personnel indicate a probability of uranium isotope induced alterations in the human genetic pool of both local civilian populations and military personnel.

Picture 1



Picture 6



Picture 2



Picture 7

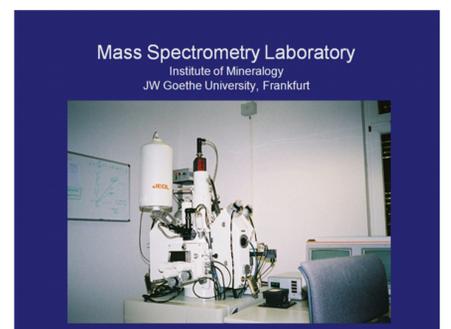
Ratio of Uranium Isotopes: "Signatures"

	^{238}U	^{235}U	$^{238}\text{U}/^{235}\text{U}$	$^{235}\text{U}/^{238}\text{U}$
Natural Uranium Composition	99.2739	0.7200	137.88	0.00725
Depleted Uranium (DU) / DU Shrapnel	99.7945	0.2028 (depleted to ^{235}U)	492.60	0.00203

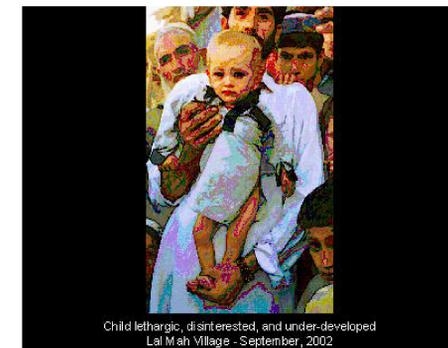
Picture 3



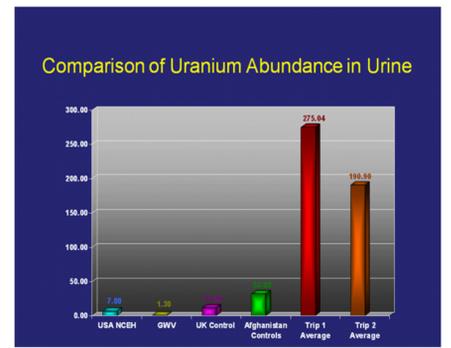
Picture 8



Picture 4



Picture 9



Picture 5



Picture 10



Contaminated town, Nangarhar - May, 2002
Afghanistan

Chromosomal changes in DU positive veterans by SKY analysis