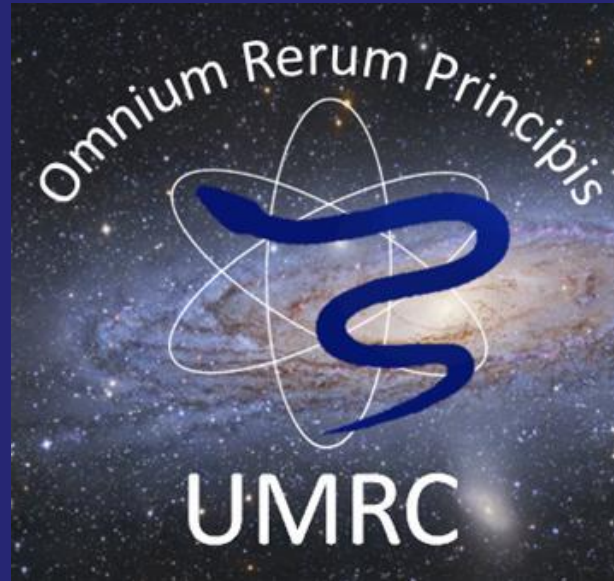


Uranium Medical Research Centre



Imamia Medics International Conference
Najaf, Iraq

April 2012

Global and Medical Consequences of Nuclear Disasters

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Medicine

Possible Scenarios of Disaster

Radiation Accidents
Nuclear power plant incidents

“Dirty bomb” / terrorist attack

Improvised nuclear device / terrorist attack

Nuclear weapon(s)
(regional / international wars)



»Nuclear Power Plant Accident



»Hypothetical Suitcase Bomb

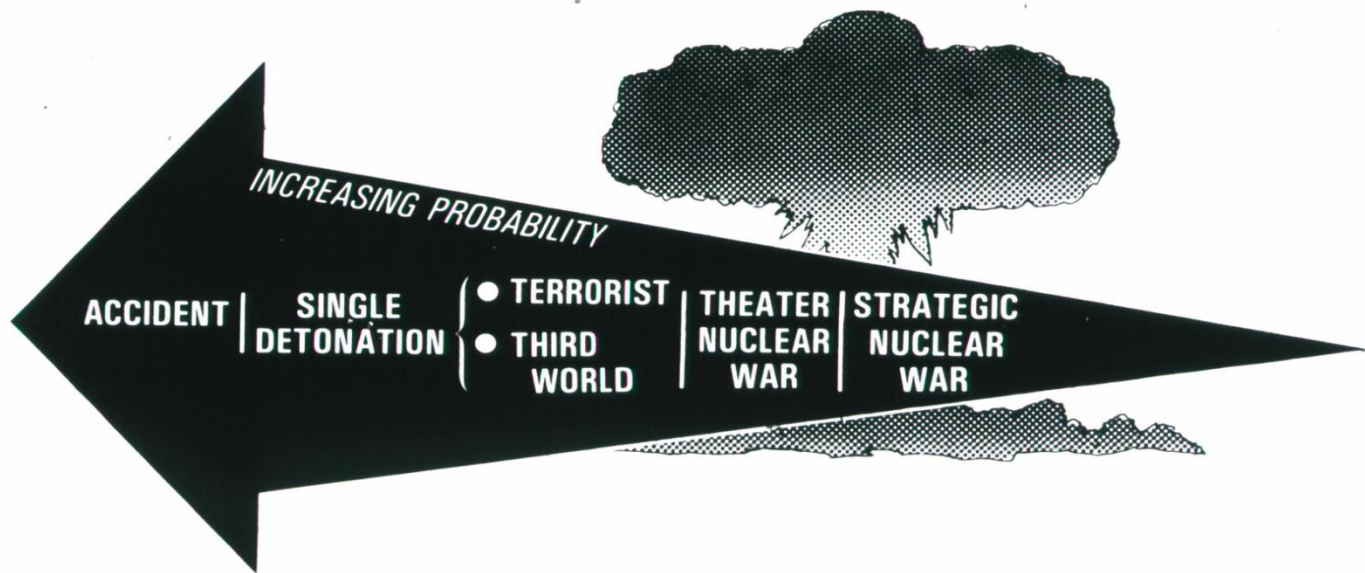


»Nuclear Weapon



»Nuclear War

Probability of Scenarios



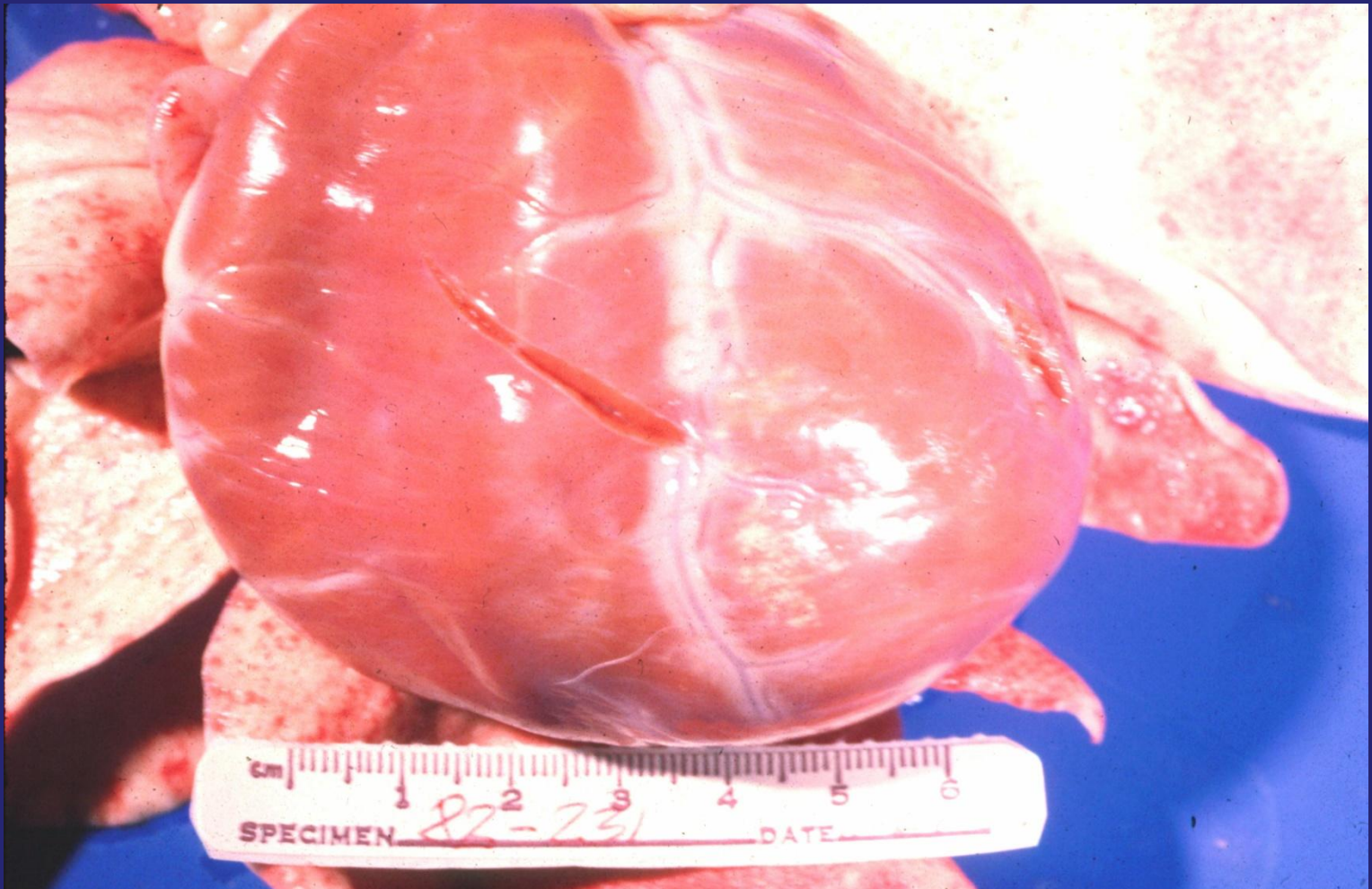
Medical Examples for Acute Radiation Syndromes

»

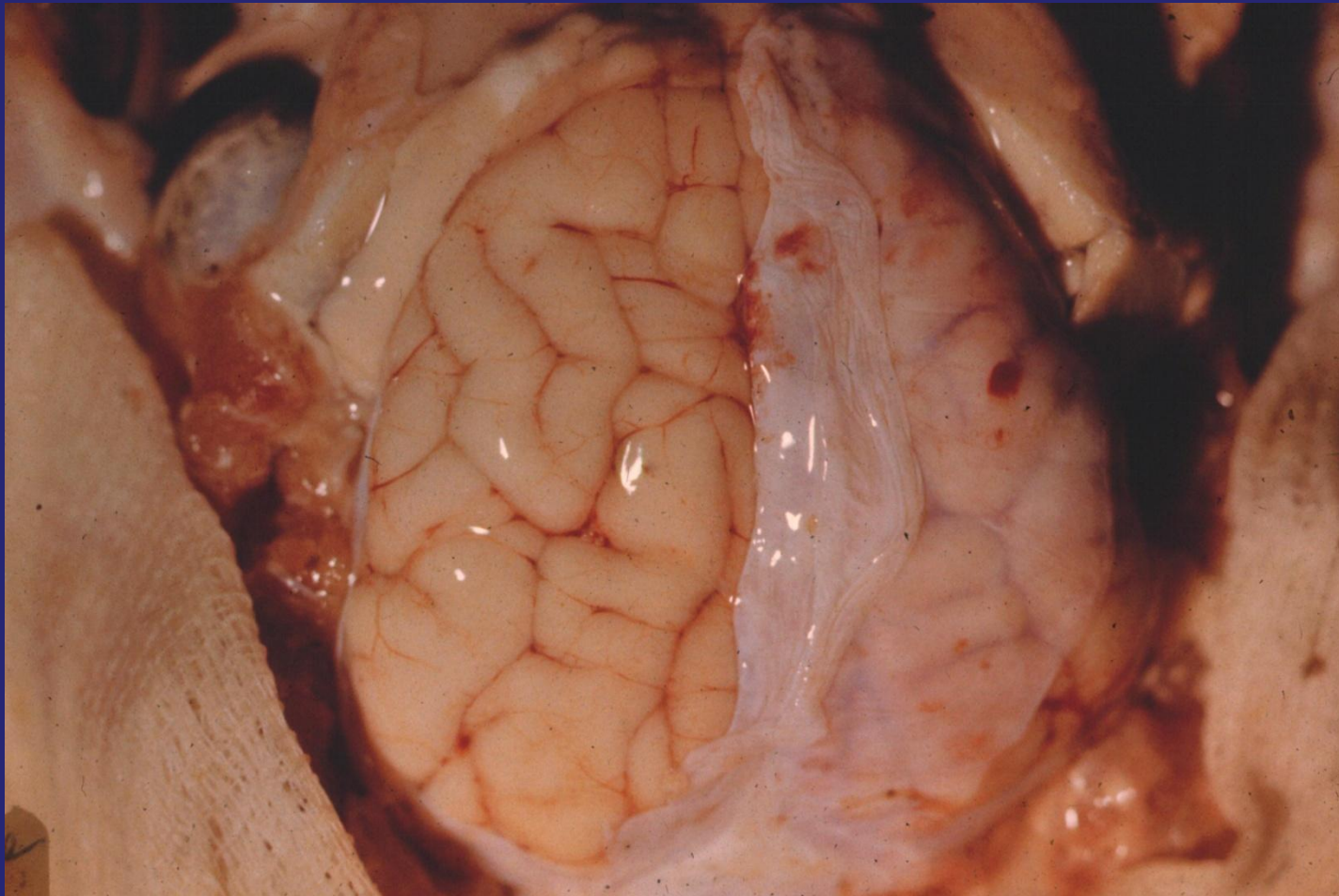
Acute Radiation Syndrome



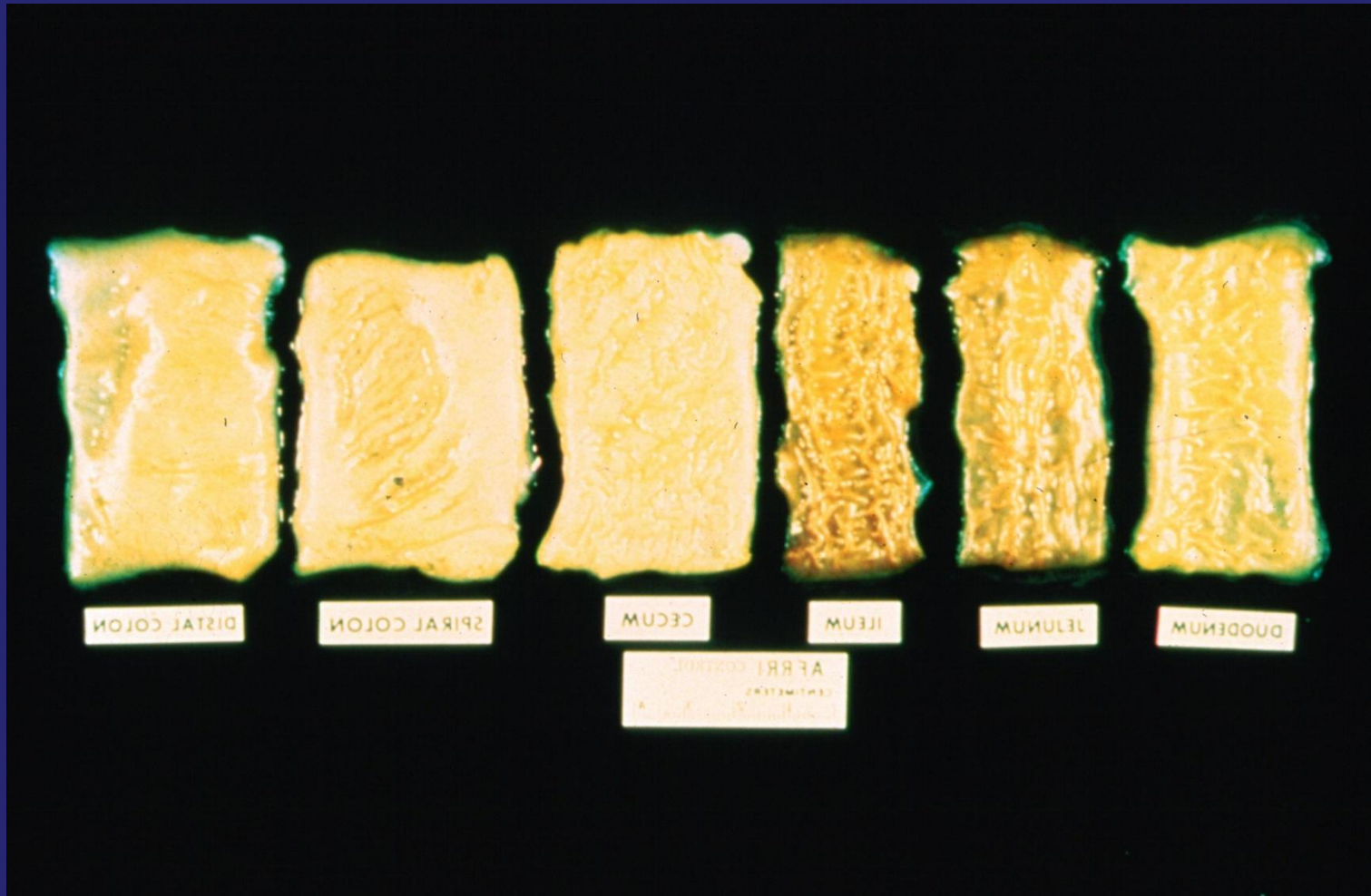
Radiated Heart



Brain Edema



Intestinal Samples: Normal

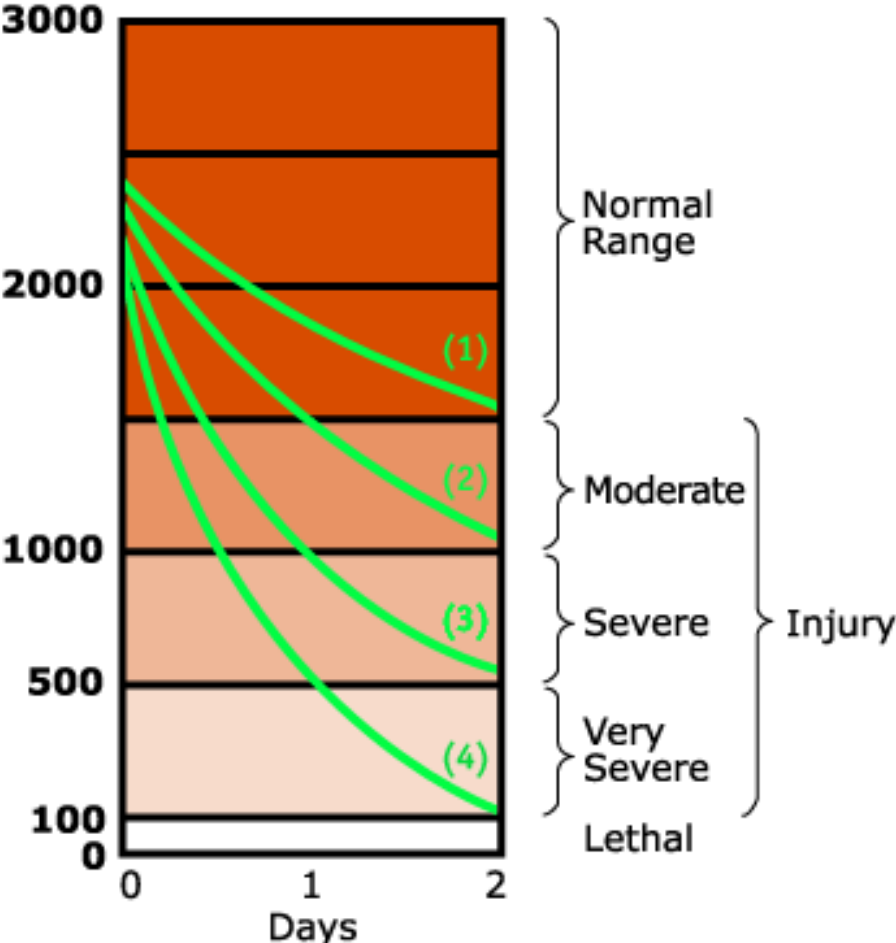


Intestinal Samples: Radiated



Blood Lymphocyte Response to Radiation

Patterns of early lymphocyte response in relation to dose.



What are the Risks to Future Children? Hereditary Effects

- Magnitude of hereditary risk per rem is 10% that of fatal cancer risk
- Risk to caregivers who would likely receive low doses is very small - 5 rem increases the risk of severe hereditary effects by ~ 0.02%
- Risk of severe hereditary effects to a patient population receiving high doses is estimated as ~ 0.4% per 100 rem

Medical Effects of Radiation Contamination

Radium is being sold commercially by the Radium Chemical Company

“STANDARD”

RADIUM PREPARATIONS



“Standard” Radium Solution for Drinking

Each bottle contains two micrograms radium element in 60 cc. aqua dist.

Maximum-equilibrium constant of radium emanation, 5400 mache units.

PERMANENT



“Standard” Radium Solution for Intravenous Use.

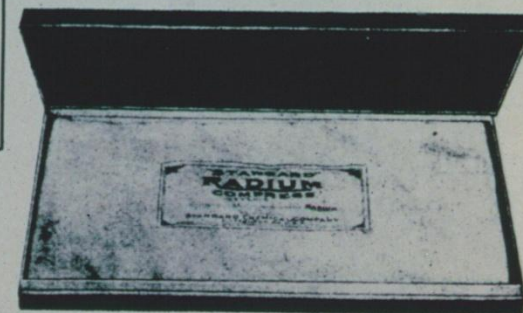
In Ampulles of 2 cc. N. P. S. S. containing 5, 10, 25, 50, or 100 micrograms radium element.

PERMANENT

“Standard” Radium Compress

A means of applying radium locally for the relief of pain.

A flexible pad of standardized, guaranteed radium element content.



PERMANENT RADIO-ACTIVITY

INDICATIONS

Subacute and Chronic Joint and Muscular Conditions.
High Blood Pressure. Nephritis.
The Simple and Pernicious Anemias.

“The value of radium is unquestionably established in chronic and subacute arthritis of all kinds (luetetic and tuberculous excepted) acute, subacute and chronic joint and muscular rheumatism (so called) in gout, sciatica, neuralgia, polyneuritis, lumbago and the lancinating pain of tabes.”—Rowntree and Baetjer, Journal A. M. A. Oct. 18, 1913.

For Descriptive and Clinical Literature Address.

New York
C. Everett Field, M. D.,
50 E. 41st St.

Boston
Samuel Delano, M. D.,
39 Newbury St.

RADIUM CHEMICAL COMPANY
PITTSBURGH

Chicago
C. W. Hanford, M. D.,
749 1st Nat'l Bank Bldg.

San Francisco
Fred I. Lackenbach
Biologic Depot
908 Butler Bldg

Women Painting Watch Faces



Treatment Decisions

Review of the Exposure Incident

Identification of the Radioisotopes

Risk / Benefit Considerations

Solubility of the Compounds

Multiple Isotope Effects

Global and Medical Consequences of Nuclear and Radioactive Disasters



Two decades of research: 1991 – 2011

Mission of UMRC

Independent research of the medical and environmental consequences of contamination of the biosphere with radioactive isotopes.

Disclaimer Statement

The Uranium Medical Research Centre has no beneficial interest by any material, financial, or political gains that could be interpreted as a conflict of interest.

Theaters of Operation

- Gulf War I: Operation Desert Storm
- Gulf War II: Operation Iraqi Freedom
- Afghanistan: Operation Enduring Freedom
- Gaza Conflicts

Uranium in the Battlefield

1. Aerosol formation as a consequence of pyrophoric properties of uranium anti-armor penetrators.
2. Deposited aerosols and oxide particles.
3. Release of uranium-rich dust to the environment.
4. Dust storms. Long-distance movement of contaminated particles.
5. Estimated quantities range from hundreds to thousands of tonnes

120mm DU Anti-tank Long Rod Penetrator



Penetrator travels at
1.5+ km/sec

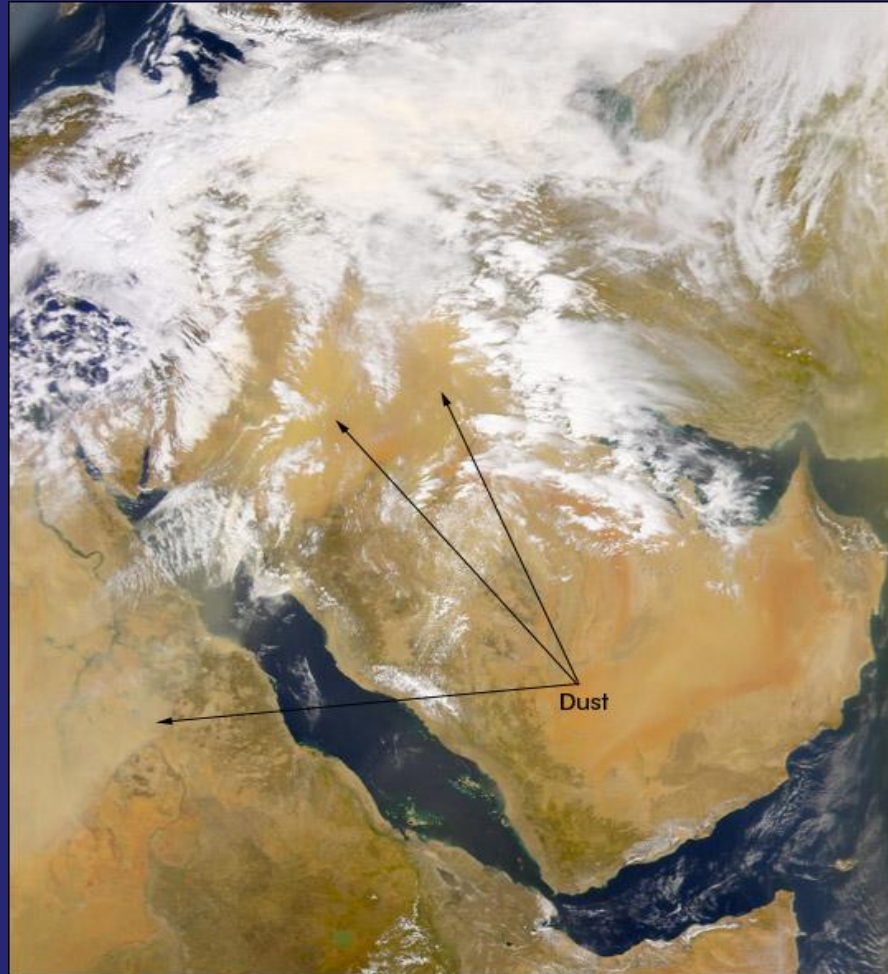


Impact equivalent to
1.5 kg of TNT

Troops in the Midst of a Dust Storm



Dust Storms over the Arabian Peninsula



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	<u>0.2026</u> <i>depleted re. ^{235}U</i>	492.60	0.00203

Gulf War I: Operation Desert Storm

Iraq 1991

Groundbreaking Studies: Gulf War I

DU contamination still found ten years after exposure

- “Chemical Forensic Detective Work: the Search for Depleted Uranium in Biological and Environmental Samples”
- Geological Association of Canada, No. 266, p 65, May 31, 2001

Evidence of depleted uranium incorporation into organs

- Radioisotopic analysis of bone, kidney, liver, and lung from deceased Gulf War Canadian veteran
- Official cause of death – Gulf War Illness

**T.R. Autopsy Specimens:
Yarmouth Regional Hospital, Nova Scotia**

	<u>U 238</u>	<u>U 235</u>	<u>U238 / U 235</u>
Lung	99.2348	0.6932	143.20
Liver	99.2792	0.7082	140.20
Bone	99.3220	0.6718	147.80

Mass Spectrometry studies conducted at the Atlantic Universities Radiogenic Isotope Facility (AURIF).

Chronology of Studies

- 1991:** Clinical, Laboratory, and Whole Body Counting Evaluation of Gulf War Veterans
- 1997:** Neutron Activation Analysis of the Urine of Contaminated Gulf War I Veterans
- 1999:** Medical Effects of Internal Contamination with Uranium
- 2001:** On Depleted Uranium Gulf war and Balkan Syndrome
- 2002:** The Quantitative Analysis of Depleted Uranium Isotopes in British, Canadian, and United States Gulf War Veterans
- 2003:** Estimate of the Time-zero Lung Burden of Depleted Uranium in Gulf War Veterans by the 24 Hour Urinary Excretion and Exponential Decay Analysis
- 2003:** Undiagnosed Illnesses and Radioactive Warfare
- 2004:** The Quantitative Analysis of Uranium Isotopes in the Urine of the Civilian Population of Eastern Afghanistan after Operation Enduring Freedom
- 2004:** Spectrometry Analysis of Uranium Concentration and Ratio, Chromosomal Studies, and Clinical Assessment of Contaminated Victims
- 2007:** **The Quantitative Analysis of Uranium Isotopes in the Population of Port Hope, Ontario**
- 2010:** **Uranium Isotopes Analysis in the Human and Environmental Samples of Gaza by Alpha Spectroscopy**

Gulf War II: Operation Iraqi Freedom

Iraq 2003 – 2010

DU Sites Investigated

Baghdad combat battlefields:

- Haiyy al Mavalemeen – teacher's district
- Auweirj coalition/SRG headquarters
- Tank-graveyard
- Baghdad gate

Central Iraq:

- Suweirah
- An Najaf
- Karbala
- Al Hillah
- An Nasiriyah
- Al Basra
- Umm Qasr



Inside the engine compartment of a destroyed Iraqi tank

G-M Counter Overloads from Sudden Increase in Radioactivity



Mass Spectrometry Laboratory

Institute of Mineralogy
JW Goethe University, Frankfurt



Iraq: Results

UMRC Field Team

Two of the three members of the UMRC field team tested positive for depleted uranium after returning from Iraq.

US WWII Soldiers in Samawah

- Depleted uranium detected in 4 of 9 urine samples
- ^{236}U detected in 3 of 9 samples
- Gravimetric data range: 1.6 – 6.2 ng/L

Gulf War II Conclusions

- Significant presence of depleted uranium in four of nine US soldiers.
- Three urine samples had definitive presence of uranium-236.

Afghanistan: Operation Enduring Freedom

2001 – present

1st Field Team Mission: Jalalabad



2nd Field Team Mission: Kabul

Afghanistan Specimens

May-June, 2002:

- Jalalabad, Lal Mah, Makam Khan Farm, Farm Arda

September, 2002:

- Jalalabad, Spin Gar (Tora Bora), Poli Cherki, Kabul, and Khandahar

June and September, 2003:

- Jalalabad, Kabul, and Bibi Mahro

Bomb Crater, Jalalabad, Afghanistan



NERC Isotope Geosciences Laboratory

Keyworth, Notts, United Kingdom



Field Team Mission: Jalalabad

Isotopic Ratios:

Natural $^{238}\text{U}/^{235}\text{U}$ and $^{234}\text{U}/^{238}\text{U}$ ratios (N=8)

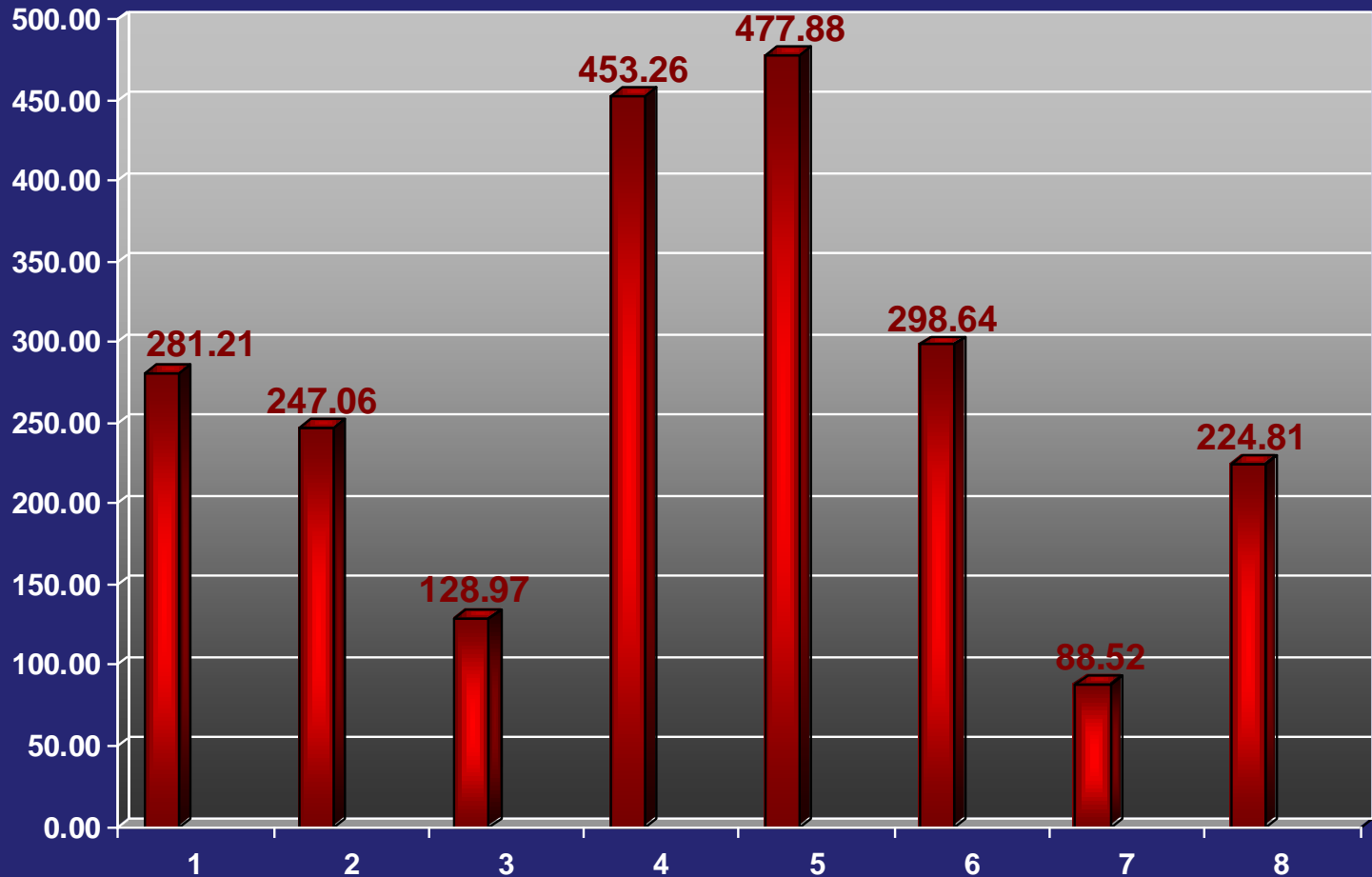
^{236}U not detected

Uranium Concentration:

88-477 ng/L compared to 1-20 ng/L in a normal population

Field Team Mission in Jalalabad: Uranium Concentration in Urine Samples

ng/L



Field Team Mission: Kabul

Isotopic Ratios:

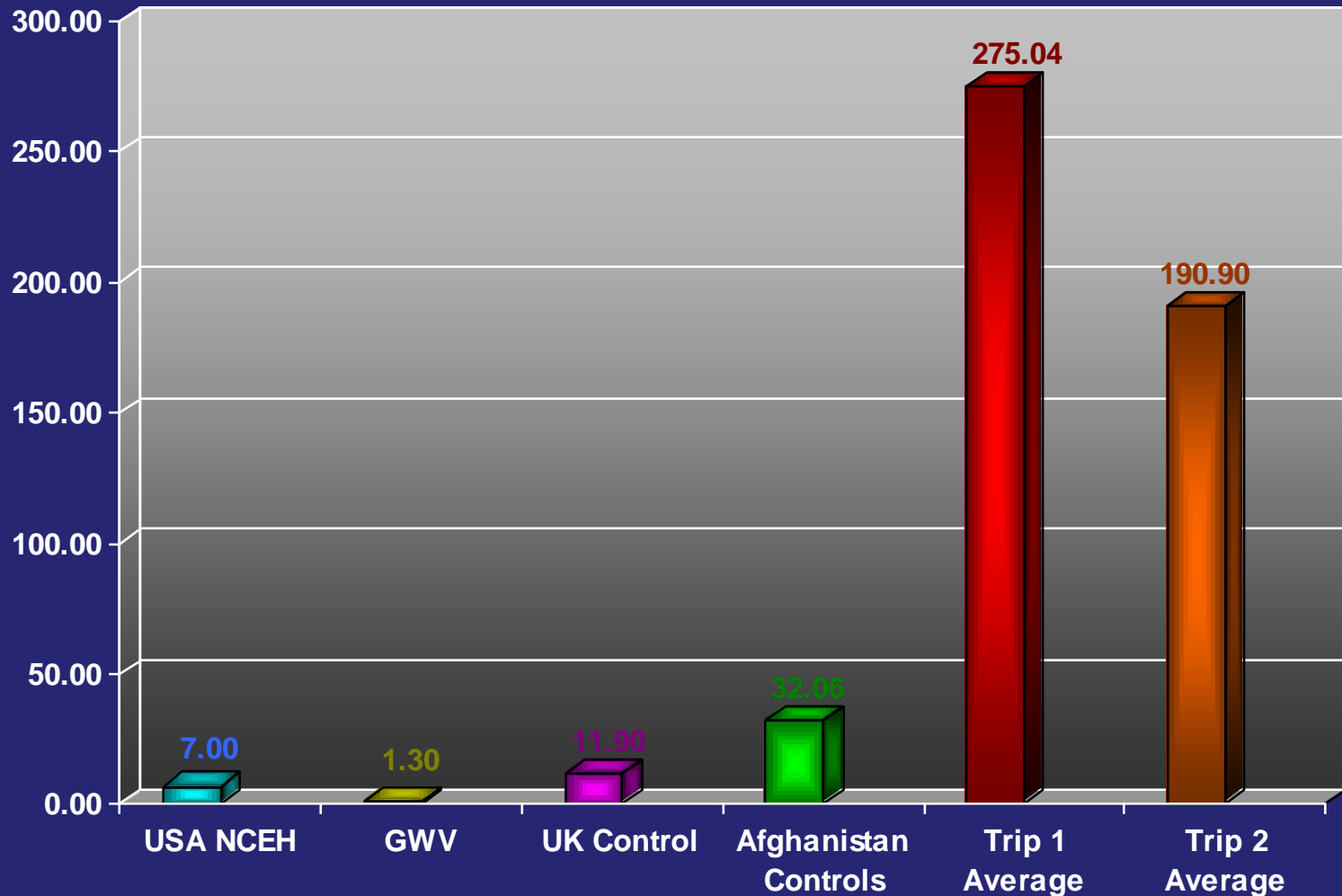
Natural $^{238}\text{U}/^{235}\text{U}$ and $^{234}\text{U}/^{238}\text{U}$ ratios

^{236}U detected in 7 of 14 samples

Uranium Concentration:

13 samples ranged from 1-100 ng/L with one child having a concentration of 2031 ng/L

Comparison of Uranium Abundance in Urine





Dust deposits contain uranium levels 11 times normal

Health Impact: Somatic

Immediate Symptoms Encountered after Bombing:

- Epistaxis and nasal discharge
- Chest pain and hemorrhagic expectoration
- Burning sensation in throat, nose, lips, or mouth
- Eye irritation
- Feeling of skin hyperthermia, rash, or irritation
- Dry cough
- Gastric and intestinal alterations
- Diarrhea

Health Impact: Somatic

Delayed Symptoms Encountered after Bombing:

- Fatigue
- Intermittent fevers, nocturnal perspiration
- Headaches
- Recurring or continuous joint, nerve, chest, and/or muscle pain
- Short-term and sporadic memory loss
- Mental confusion and disorientation
- Depression and loss of initiative
- Chronic cold, influenza, recurrent viral illnesses
- Asthma, chronic bronchitis
- Dry or productive cough
- Lower-back pain
- Dysuria
- Gastrointestinal problems
- Anorexia

Health Impact: Somatic

Chronic Symptoms Encountered after Bombing:


- Progressive kidney pain, lower back discomfort
- Sexual dysfunction
- Miscarriages and/or birth defects
- Infant and new-borne unexplainably ill, weak, lethargic, rashes
- Failure to thrive in children
- Increasing numbers of family and community health problems
- Changes in immune system

Health Impact: Genetic

- 5 Gulf War veterans previously assessed for urinary uranium concentrations
- Genomic assessments were made using spectral karyotype (SKY) imaging.

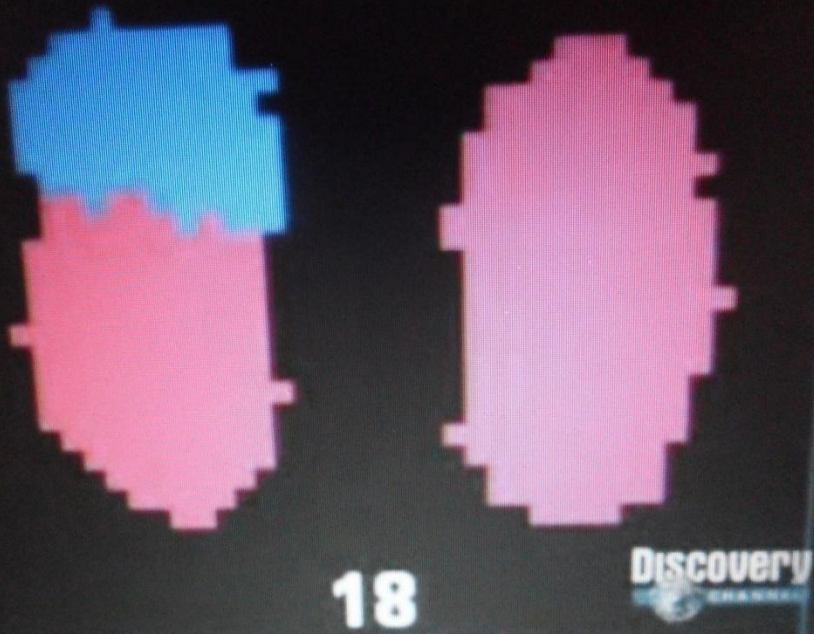
Genetic Results

- Elevated uranium concentrations and $^{238}\text{U} / ^{235}\text{U}$ ratios beyond natural range were found to be significant in two of the five participants. However, ratios of $^{238}\text{U} / ^{235}\text{U}$ were suggestive of a DU signature in all five cases. SKY testing supported increased levels of genomic variation in all five participants at a rate suggestive of ten times a normal range.
- These studies are to be continued . . .

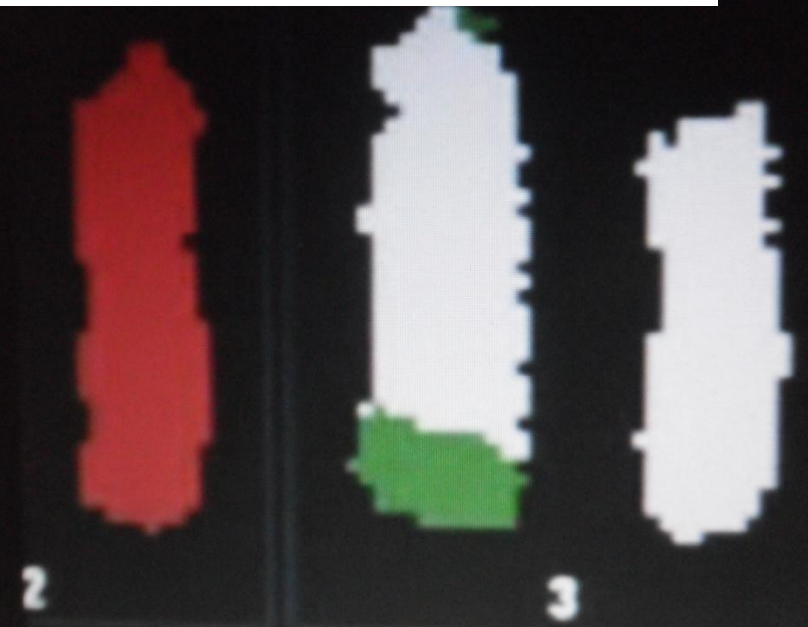
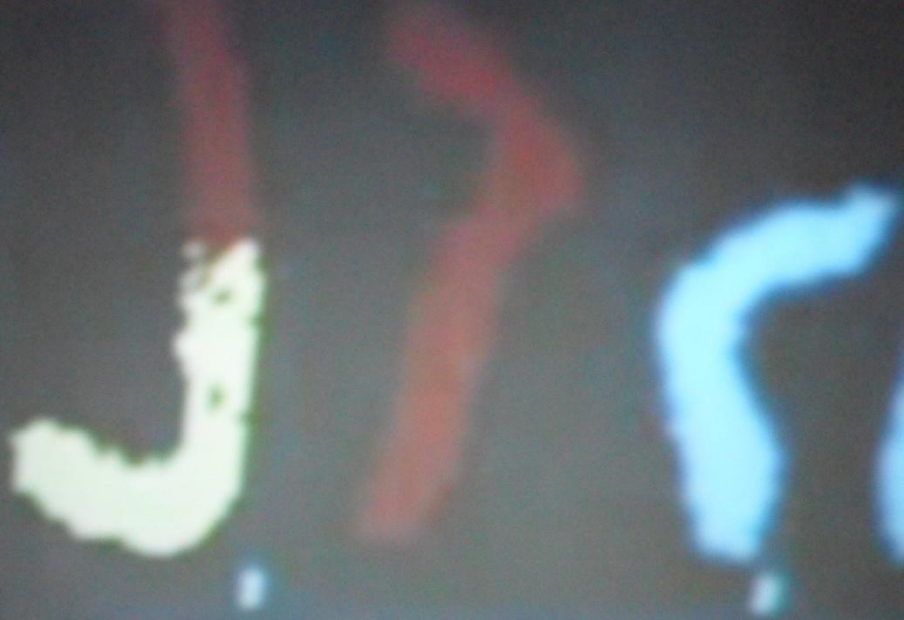
A man with white hair, wearing a dark suit, white shirt, and dark tie, is speaking. He is in a laboratory setting with shelves of equipment and bottles in the background. The image has a halftone or dithered texture.

DR. ASAF DURAKOVIC
Director of Research
Uranium Medical Research Centre

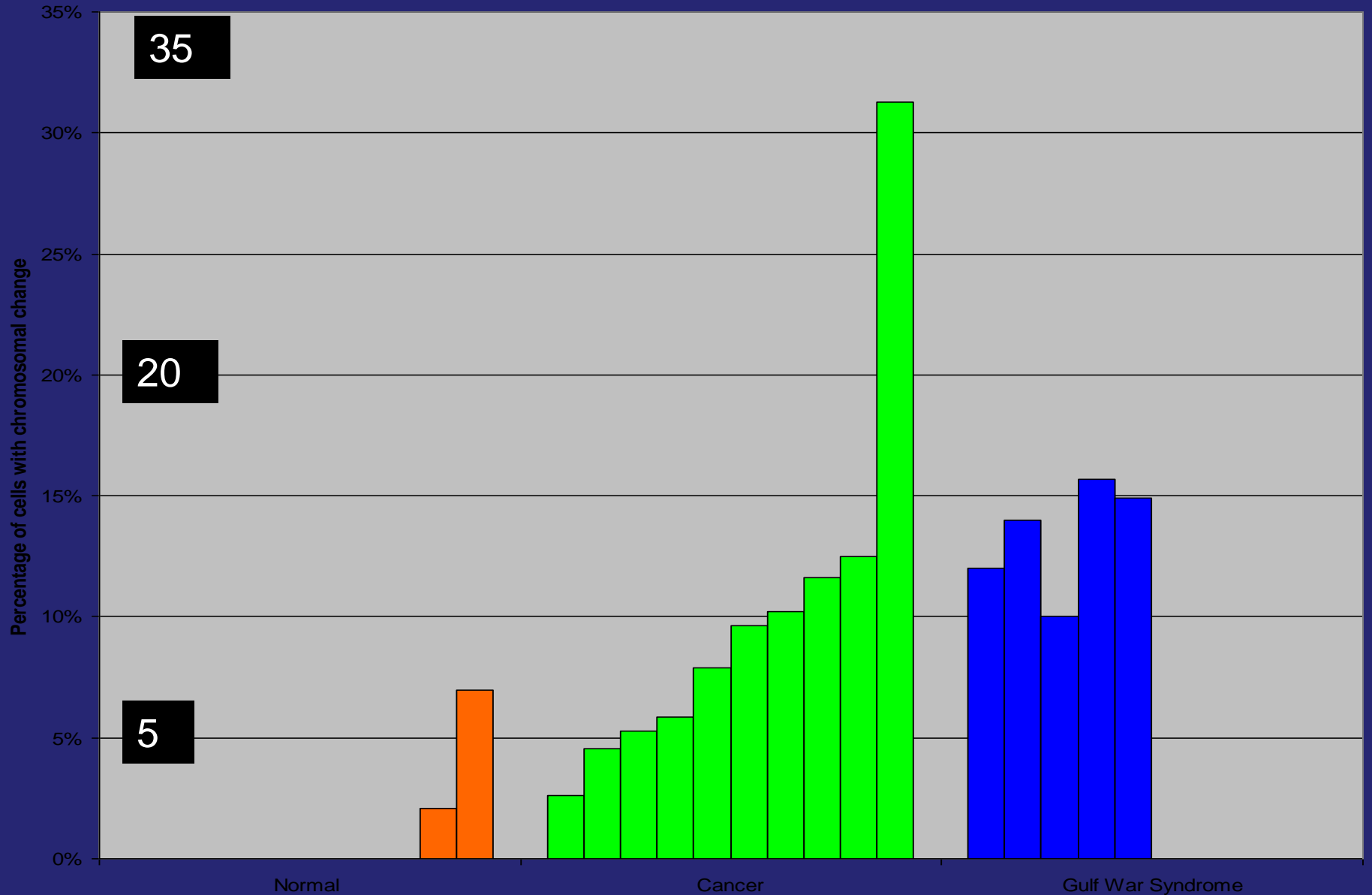
DISCOVER



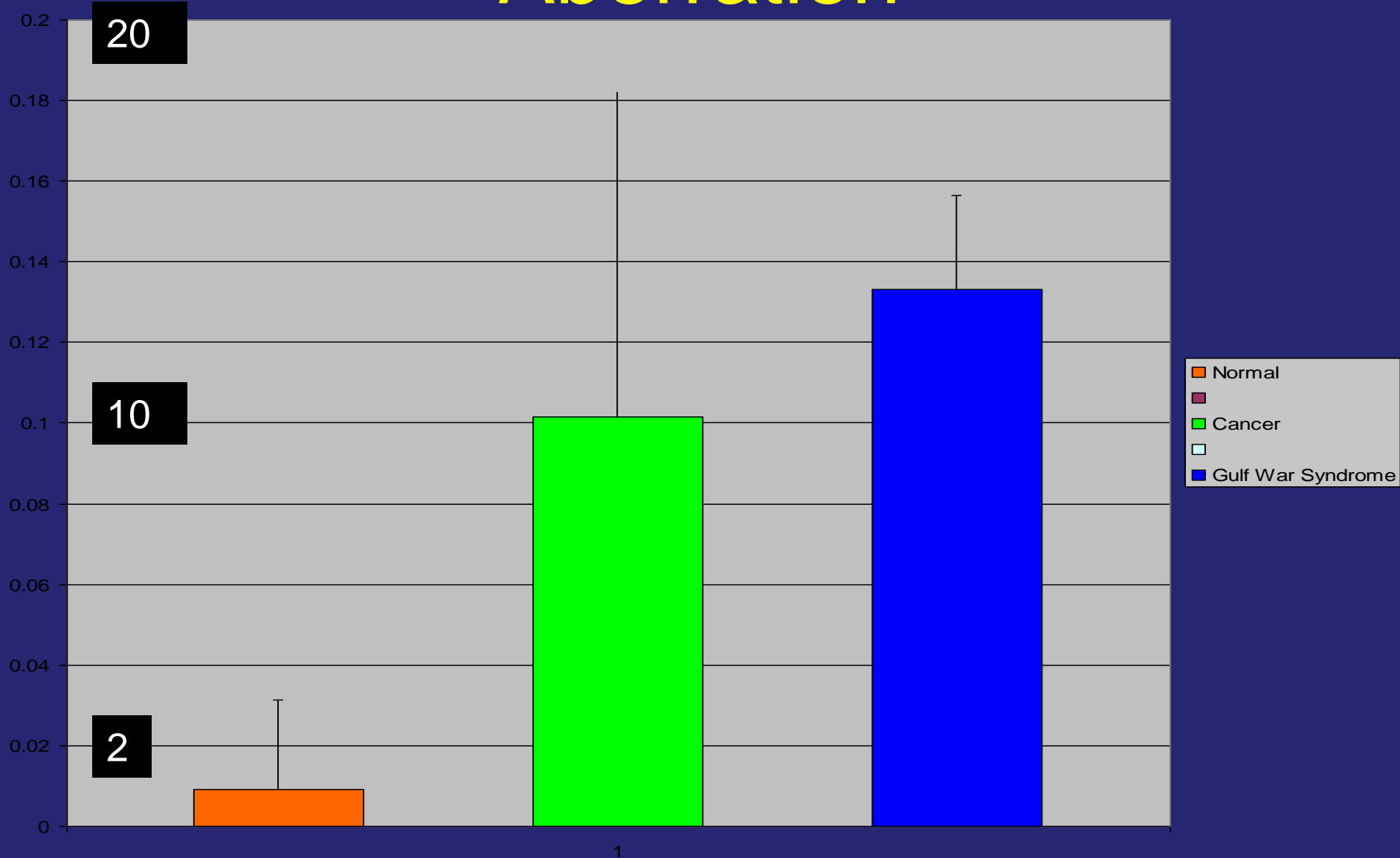
Chromosomal Changes in DU Positive Veterans by SKY Analysis



Percent of Cells with Chromosomal Change



Average % of Cells with Aberration



Gaza Conflicts

2005 – present



The Analysis of Uranium Isotopes in Gaza by Alpha Spectrometry

- Presence of the isotopes with enriched uranium signature from the recent military conflicts in Lebanon (2006) and Gaza (2009) has been reported (ECRR 2010 No2 Brussels 2010).
- Our study meant to analyze possible contamination in the civilian population of Gaza Strip in 2009.
- Urine samples collected from population exposed to the dust following Operation Cast Lead (December 27, 2008 – January 18, 2009).

Participants

- A total of 12 subjects from Jabaliya, Beit Lahia, Rafah, and Gaza City were selected on the basis of their history of exposure and symptoms.
- Samples were analyzed for the uranium isotopes at the Harwell Science and Innovation Centre, England.

Conclusions

Our results demonstrate that neither depleted uranium nor man-made uranium isotopes are detectable in Gaza civilians by the radio-chemical separation and alpha spectrometry analysis. This method does not provide an alternative to sensitivity and specificity of inductively coupled plasma mass spectrometry (ICP-MS).

Future Research

- Two decades of research suggest a potential of somatic and genetic adverse alterations of the human health and the biosphere.
- The current conflicts in the Middle East , Libya , and other potential war theatres warrant further interdisciplinary studies of the environmental and health impact of uranium isotopes.

