
بسم الله الرحمن الرحيم

Uranium Medical Research Centre

Washington, New York, Toronto, London

www.umrc.net

Asaf Durakovic

M.D., M.Sc., DVM, Ph.D., FACP

Professor of Medicine, Radiology, and Nuclear Medicine

Director, Uranium Medical Research Centre

Washington, New York, Toronto, London

asaf@umrc.net

CBRN Warfare

Chemical

Biological

Radiological

Nuclear

Medical Concern of the CBRN Current Global Reality

Chemical Warfare

Chemical Weapons

Man-made poisons

Gases, liquids, aerosols

Easily acquired

Mass casualties

CW System Components

CW carrier

Artillery shell

Chemical agent

Two Main Groups

Non-Persistent

(volatile, offensive)

Persistent

(mostly defensive)

Four Basic Categories

1. Choking Agents (chlorine, phosgene)
2. Blood Agents (hydrogen cyanide)
3. Vesicants (mustard gas)
4. Nerve Agents (Tabun, Sarin, VX)

Production of CWA

Chemical industry

Pesticide plants

Commercial facilities

A simple process

Corrosion-resistant equipment

Blister and Nerve Agents

Used in Iran-Iraq war

Large stockpiles in the U.S. and Russia

Binary Weapons

Two low toxicity chemical stored separately and mixed shortly before use, forming highly toxic CWA

CWA Production

Simple (personal equipment)

Air filter equipped shelters

100 percent efficient

Terrorist CWA

Small Amounts

Inexpensive, easily acquired

Strategic impact

Blackmail

MCSS

Multiple chemical sensitivity syndrome

University of Boston study

Occupat. Med. Sept. 2000

Unanswered questions
Inadequate research, further studies needed

Sensitivity to concentration chemicals

Scand. J. Environ. Health 12, 1999

No adequate research available

GWS and CW

Postulated relationship CW and Al-Eskan disease (dirty sand)

Toxic chemical microimpregnated on dust particles

Immune system depletion

Military Medicine May 2000

Recent Sulfur Mustard Data

Used in 1984-1985 against Iranian soldiers

USSR against Afghanistan

Gulf War 1991

Majnoon Island 1985 Iraqi attack

1985 Halabiya-Kurdistan
5000 deaths in ten minutes

Pharmacol. Rev. 1996

GWS and Chemical Agents at Khamisiya, March 1991

Nerve agents subclinical exposure

Am. J. Epidemiology Sept. 1999

Hospital Preparation for Chemical Warfare

Need for disaster drill exercises

Al-Jubayl, Saudia Arabia

110 anti-CWA operations performed

J. Royal Coll. Surg. 1992

AUM Shinrikyo

Tens kilograms of Sarin gas produced in a non-professional laboratory

Mass casualty attack-Japan

CWA

Highly persistent

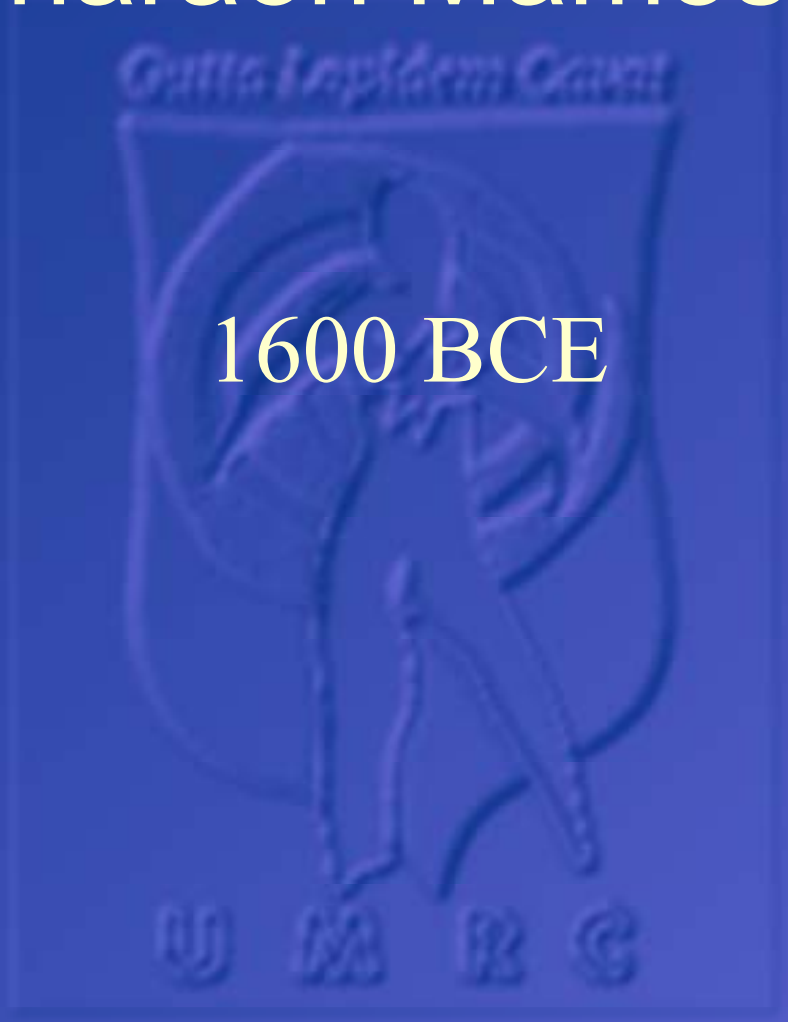
Extended uninhabitable areas

Costly decontamination and clean-up

Biological Warfare

Pharaoh Mamose

1600 BCE



GWS and BWA

No evidence of relationship

Mayo Clinic Proc. 2000

Due to BWA in GW

Family Med. 2000

University of Zurich

Serious threat of Botulism and Anthrax in terrorist hostilities

J. of Infection March 1997

JAMA, August 1997

Iraqi biological weapons developed 1985-1991

Anthrax, Botulism, Aflatoxin

200 Bombs

25 Balistic Missiles

GWS and Prophylactic Immunization

Multiple assault on immune system

Medicine and War, Sept. 1994

BWA and Food Safety

G-8 major concern

Annals NY Academy Sci. 1999

Plague

1341 in Paris 800 deaths a day

Endemic (animal reservoirs)

Epidemic (1921 Madagascar)

Impossible to control

Contained in Iraq biological program

Annals Pharmaceutique Francais Jan. 2000

Lessons of Bioweapons for Iraq

Nature, 1999

Detection of BWA in Air Samples

Korea

Kuwait

Bahrain

Mil. Med. August 1999

High Risk of BWA in the Middle East

Lancet Feb. 1998

BWA a Realistic Risk in Future Warfare

Zurich, J. Infect. March 1997

Biological Warfare Agents

Minimal potential hazard

Infectious cultures

Concentrated cultures

Exceedingly hazardous

BWA Current and Future Threat

1. Hemorrhagic Fever
   (Congo, Ebola, Lassa, Omsk, Krimean)
2. Encephalitis
   (Russian, Kazakhstan)
3. Anthrax
4. Brucellosis
5. Tullaremia
6. Plague
7. Malleus

Strategies for Prevention of BWA Attack

Airborne (helicopter) laser detection of BWA aerosol

M-17/M-40 mask

HEPA filter respirator for undetected aerosol attack

M-17/M-40 Removes particles (0.3-15m) with 100% efficiency

Vaccination against:
(Anthrax, Tularemia, Q-Fever, Plague, Botulism, Staph. Toxins)

Terrorist BWA Planning

Detailed knowledge of a target

Level of protection

Vaccination

Medical Readiness

Hygiene

Levels of Resistance

Overt BWA Warfare

Unrestricted attack

Efficient outcome

Covert BWA Attack (Terrorism)

Unsuspected

Use of local common diseases

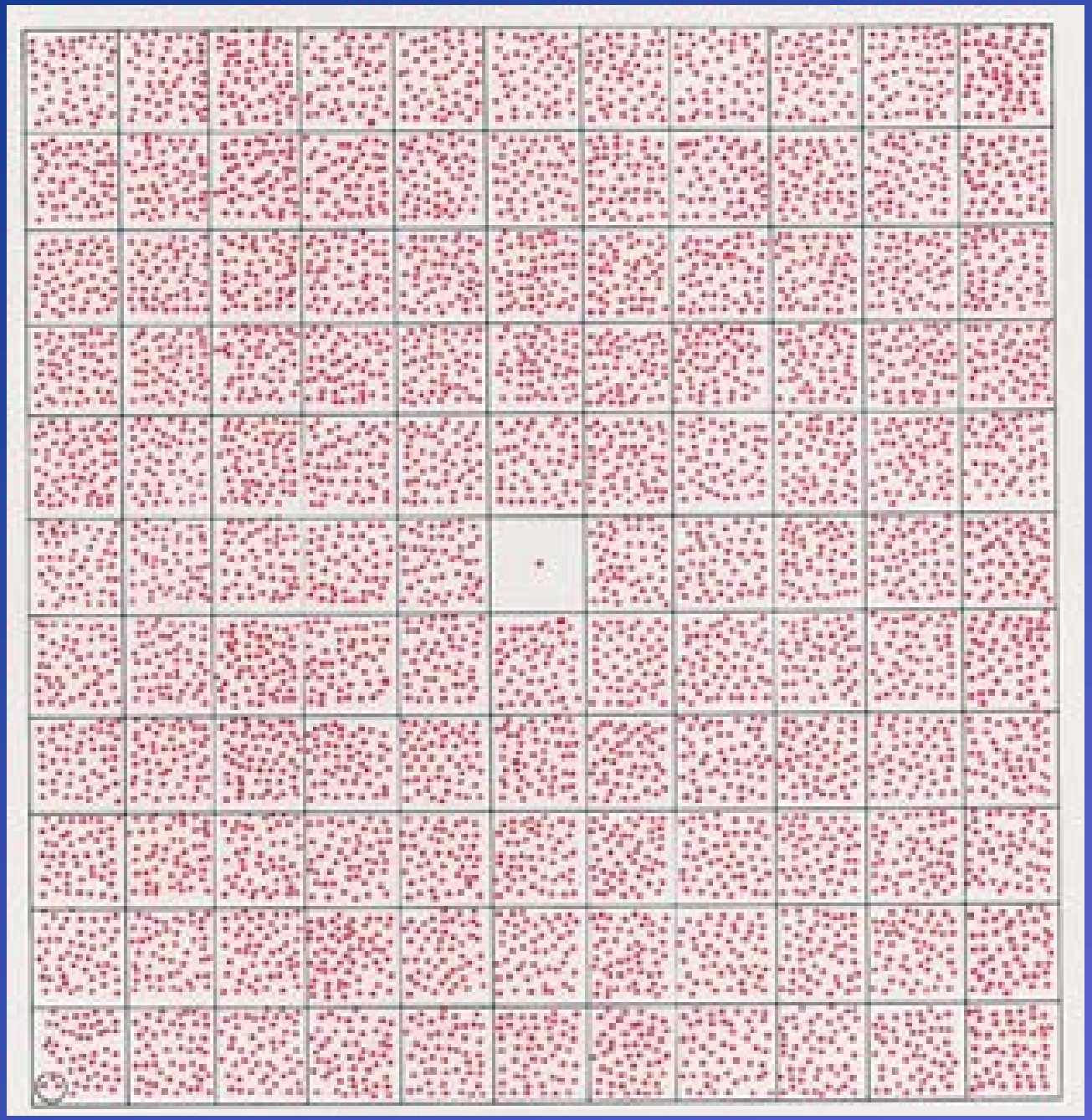
Masked as a natural outbreak

10 Gulf War BWA Lessons

1. Russian BW program
2. Iraq BWA development after GW
3. Currently, 17 countries have BWA program in place
4. Tactical, strategic and political weapons
5. Deterrent against superior enemy
6. Easily produced, inexpensive
7. Terrorists can not be identified
8. Available large scale production
9. Recombinant DNA technology
10. RDNA special properties for terrorist use

Nuclear Warfare

Reality of Nuclear War



Twin Towers
Milestone in Future Nuclear Conflict

US Global Positioning System

Any target

Anywhere in the world

Ground Penetrators Current Nuclear Device

1200 lbs

B-61-11 gravity bomb

20 ft rock penetration

US DOE

Sandia National Laboratory
Albuquerque, New Mexico

Artillery tubes

Molten rock

Next Generation Bunker Busters

Protection of artillery barrel
by carbon nanotube sheath

Shortfall-unexploded a-bomb

The next nuclear weapon

100 ton

200 times less than Hiroshima

Shallow penetration

Containment at 250 ft

Escape of radioactive gases

Sulky Test

18 Dec. 1964

Nevada test site

Small nuclear warhead (0.1 kT)

89 ft below ground

Radioactive gas plume

Test Sites

Arizona
California
Colorado
Idaho
Nevada
Utah
Wyoming

All failed to contain radioactive gases

Suitcase Nukes

Ideal terrorist weapon

A consequence of new low yield nuclear weapon proliferation

1994

US Congress stops the research and development of precision low-yield nuclear warheads

Defense Threat Reduction Agency, US DOD

Low yield A-bomb bunker buster

Melting rock will seal the escaping radioactive plume

2001

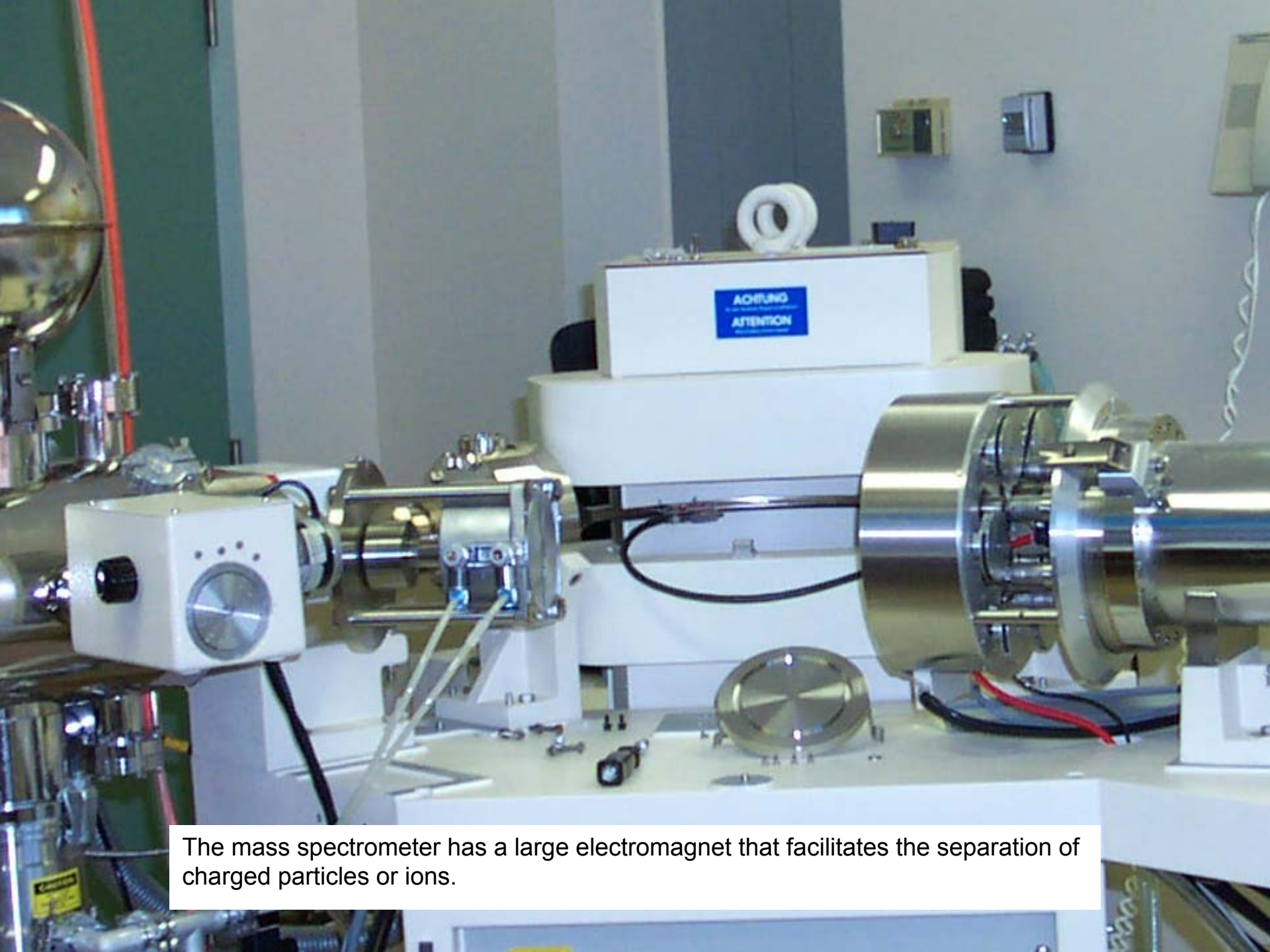
Princeton University science and global security program

DOD proposed A-bomb penetrator would not contain radioactive plume

Radiological Warfare

The Decade of Depleted Uranium

An Update of the Quantitative Analysis of Uranium Isotopes in British, Canadian, and United States Gulf War Veterans



The mass spectrometer has a large electromagnet that facilitates the separation of charged particles or ions.

For Natural uranium we have:

^{238}U - 99.2745% abundance and ^{235}U - 0.7200% abundance

238U/235U = ~137.88

For Depleted uranium we have:

^{238}U - 99.7945% abundance and ^{235}U - 0.2026% abundance

$^{238}U/^{235}U = 491.87 \pm 0.16$

When someone has been exposed to DU, there is a shift in the ratio from 137.88 towards the DU ratio of 492. This is the marker that shows exposure to DU.

We see in this slide the ratios for natural and depleted uranium. When a person has been exposed to DU, this $^{238}U/^{235}U$ ratio shift towards the ratio 492. This is the marker or fingerprint, if you will, that shows exposure to depleted uranium. There is no other way of shifting the $^{238}U/^{235}U$ ratio above the natural value of 137.88.

Results of autopsied bone fragments from deceased Canadian veteran

Sample#	238U/235U	2 sigma	234/238	2 sigma	236/238	2 sigma
Vertebra	147.6721	0.190	0.000057	0.0000360	0.000013	0.000002
Vertebra	147.8660	0.413	0.000052	0.0000005	0.000009	0.000002
Vertebra	148.0673	0.562	0.000052	0.0000007	0.000009	0.000001
Vertebra	147.7731	0.352	0.000051	0.0000014	0.000009	0.000002
Sample#	U238%	U235%	U234%	U236%		
Vertebra	99.3205%	0.6726%	0.0056%	0.0013%		
Vertebra	99.3222%	0.6717%	0.0051%	0.0009%		
Vertebra	99.3232%	0.6708%	0.0051%	0.0009%		
Vertebra	99.3219%	0.6721%	0.0051%	0.0009%		

This slide shows the results for the bone analyses from a deceased Canadian veteran. As you can see the bone sample shows a shifted 238U/235U ratio indicating the presence of DU.

Original Results of Urine Analysis

- DU present in 13/27 samples

$^{238}U > 99.45\%$

$^{235}U < 0.52\%$

- The average ratio

$^{238}U / {}^{235}U > 208.4$

The results confirm the definitive presence of

$^{234}U > 0.0066\%$

and

$^{236}U > 0.0039\%$

Table 5: Ratio of Uranium Isotopes

	U 238	U 235	U238/U235	U235/U238
Natural Uranium	99.2739	0.7200	137.88	0.0073
Shrapnel (DU)	99.7945	0.2026	492.60	0.0020
Urine	99.3728	0.6119	178.1	0.0062

Conclusion

The results demonstrate a significant presence of DU in the urine of Gulf War Veterans nine years after inhalational exposure and warrants further investigation.

Depleted Uranium Concentration in the Lungs of Allied Forces Gulf War Veterans at the Time of Exposure

Objective of the Study

The purpose of this study is to report an estimate of the amount of DU in the respiratory system at the time of exposure from the quantitative current rate of daily excretion.

Summary

Our work provides a model for estimating the minimum pulmonary concentration of DU at time zero by utilizing gravimetric and mass spectrometric data of the DU isotopes in 24-hour urinary samples and theoretical model of DU dissolution time in simulated interstitial lung fluid.

Conclusion

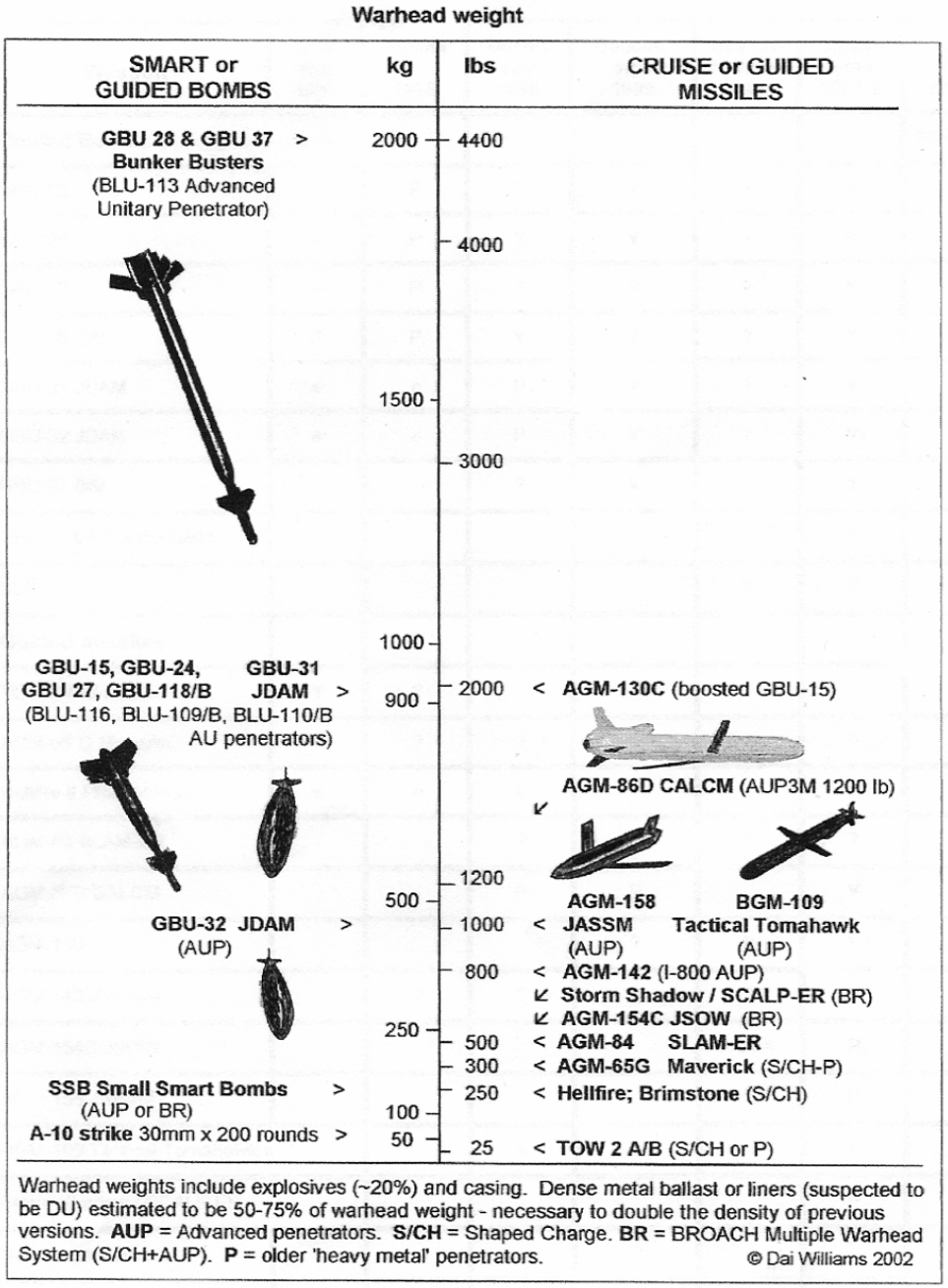
The results provide conclusive evidence that the pulmonary concentration of DU at time zero can be quantitated as late as nine years after inhalational exposure.

Evaluation of Carcinogenic Risk of Depleted Uranium in the Lungs of Gulf Veterans

A 24-hour urine specimen of a subject containing 0.150 micrograms (μg) of DU corresponds to the inhalational exposure of 1.54 mg of DU at time-zero with an alpha-radiation dose of 4.4 milliSievert (mSv) during the first year and 22.2 mSv of alpha-radiation to the lungs within ten years.

Figure 1

Hard target guided weapons in 2002: smart bombs & cruise missiles with "dense metal" warheads (updated September 2002)



Warhead weights include explosives (~20%) and casing. Dense metal ballast or liners (suspected to be DU) estimated to be 50-75% of warhead weight - necessary to double the density of previous versions. **AUP** = Advanced penetrators. **S/CH** = Shaped Charge. **BR** = BROACH Multiple Warhead System (S/CH+AUP). **P** = older 'heavy metal' penetrators.

D. Williams 2002

Table 1: Combat use of known and suspected conventional Uranium weapon systems with dense metal penetrators or shaped charge warhead technology (updated September 2002)

Weapon	Gulf War 1991	Bosnia 1995	Desert Fox 1998	Balkans War 1999	Iraq no-fly zone 1992>	Afghanistan 2001-2	Iraq 2002 /2003
Guided Bombs (AUP upgraded versions)							Big BLU
GBU-15	e	P	?	Y	?	Y	?
GBU-24	e	P	?	Y	?	Y	?
GBU-27	e	P	?	?	?	Y	?
GBU-28 B/B	P	P	Y	Y	?	Y	?
GBU-31 JDAM	e	e	P	Y	?	Y	?
GBU-32 JDAM	e	e	P	Y	?	Y	?
GBU-37 B/B			?	Y	?	Y	?
GBU-118/B Thermobaric						Y	?
SSB					P	P	D
Guided missiles							
TOW 2 A/B A/tank	Y	?					?
AGM-65 G Maverick	Y	?	?	?	?	?	?
Hellfire II / Brimstone	e	e	e	?	?	?	?
AGM-84 SLAM-ER			?	?	?	?	?
AGM-86D CALCM			P	P		Y	?
AGM-130C				?	?	Y	?
AGM-142 Hav Nap		?	?	Y	?	Y	?
AGM-154C JSOW					154 A	P	D
AGM-158 JASSM						P	D
BGM-109 Tactical Tomahawk e			e	E		P	D
Storm Shadow / SCALP ER						P	D
Sub-munitions							
BLU-108/B A/Tank cb				?		?	?
BLU-97B cluster bomb				Y		Y	?
Armor-piercing ammunition (DU confirmed)							
20mm Phalanx sea-to air							

D. Williams 2002

CBRN Publications

	2001	2002
CW	138	77
BW	152	140
RW	1	0
NW	87	62

Uranium Medical Research Centre

www.umrc.net

The Future

وَتَكُونُ ٱلْجِبَالُ كَٱلْعِهْنِ ٱلْمَنفُوشِ