

CANCER TREND IN BASRAH, IRAQ

DEPLETED URANIUM – 4.5 BILLION YEARS' HEALTH RISK

12.9.2006 AT 17–20 AUDITORIUM IN THE PARLIAMENT HOUSE

PROGRAM_____

17.00 Welcome by Mr. **Pentti Tiusanen**, chair of the Environmental committee of Parliament

17.05 *Environmental contamination with depleted uranium in southern Iraq. Epidemiological study on increase of cancer in Basrah region*, dr. **Jawad Al-Ali**, director of the Cancer Center, Sadr teaching hospital, Basrah, Iraq

Discussion

18.05 *Grounds for the demand of a total ban on uranium weapons*, dr. **Katsumi Furitsu**, board and science team member of the International Coalition to Ban Uranium Weapons ICBUW, Japan

18.20 Coffee break

18.40 *Depleted uranium - the soldier's creeping health risk*, major **Kauko Pippuri**, UN peace keeping veteran, Finland

18.50 *The European political landscape regarding the ban on uranium weapons - with focus on Belgium*, Ms. **Ria Verjauw**, representative of the Belgian Coalition and board member of the ICBUW, Belgium

19.05 *The potential toxicity of depleted uranium in the post-war civilian environment*, dr. **Keith Baverstock**, former senior research adviser, WHO's Radiation section; researcher, department of Environmental sciences, University of Kuopio, Finland

19.15 *Iraqi Children's Tooth Project*, dr. **Thomas Fasy**, one of the initiators of the project, Mt. Sinai hospital, New York, USA

19.25 *Commentary*, Ms. **Heidi Hautala**, chair of the Green parliamentary group

19.35 Discussion

19.50 *Closing the seminar*, Mr. **Pentti Tiusanen**, chair of the seminar

Simultaneous interpretation English-Finnish-English

Organizers: the parliamentary group of the Left Alliance, the Green parliamentary group, Amandamaji reg. ass./Women for Peace, No More Nuclear Power movement, the Finnish Peace Committee reg.ass.

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(Abstract)

EPIDEMIOLOGICAL STUDY AT THE SOUTH OF IRAQ (BASRAH CITY)

By Dr. Jawad Al-Ali

INTRODUCTION:

The environment at the south of Iraq has been damaged by contamination during the 1991 aggression and the second aggression in 2003. Depleted uranium weapons were dropped at the west of Basrah in 1991 (300 metric tons) then more than one thousand metric tons dropped inside the cities, (people residency areas), during the 2003 war. The level of radiation in the area has been increased several times (Professor Suad Al-Azzawi and Mr. Khajak). In addition to the radiation contamination, chemical contamination from the use of huge amount of traditional bombs added more risk to the inhabitants of the city. Another factor is the biological factor resulted from the uncontrolled infections contributing to the tragedy of increased cancers and morbidity at the south of Iraq.

Depleted Uranium led to radiation contamination of soil, water and atmospheric air. This contamination has been confirmed by studies done by Professor Suad Al-Azzawi and Mr. Khajak Wartanian.

Cancers as well as congenital birth defects were among the diseases whose risk is increased as a result of that contamination. Our epidemiological studies in Basrah were carried out on cancer incidence, cancer mortality and congenital birth defects for the last ten years and reported some increase in these indicators. However these research works has been criticized by local researchers and international writers for possible bias in their results.

Regardless of whether this increase in risk of cancers in Basrah is real or artificial, the reported cases do not represent the true situation because of incomplete cancer registration.

For the above reasons we are now trying to restudy the cancer rate based on better collection of data and nearly complete registration. The results indicate clear increased

in the registered cancer cases, probably reflecting real increase in cancer risks at the south of Iraq.

METHODS AND SUBJECTS:

The results reported by this study are based on all cases of cancers which were diagnosed in Basrah during the year 2005 and registered at the oncology center in Basrah, the cancer control center and cancer registration section at the department of pathology and forensic medicine (college of medicine in Basrah).

The time trend were compared using the registration during the years 1990, 1997, 1999 and 2005 which were 488, 544, 688 and 1375 in that order. The total number which is registered during the year 2005 was 1822 patients.

Information related to population was based on data from Basrah Health Authority, the electorate lists and the Statistical Office in Basrah.

The age structure was based on pool of ten household surveys done in Basrah during the previous years.

RESULTS:

From the study we found variable degrees of increased rates of cancers, particularly breast cancer, lymphomas, lung, colo-rectal ovaries, soft tissues and kidneys. Cancers which show no increase include the cancers of stomach, uterus and skin cancers. The overall incidences over the year showed tangible increase particularly during the year 2005.

Geographical distribution: the highest rate was in the west of Basrah followed by the center of Basrah, eastern area and the lowest is at the northern area. The age risk: the data showed massive increase in risk with age. The lowest rate is for the children less than five years (11.4/100.000). the highest rate

was for the age group more than 65 years (541.9/100.000). The total incidence rate was 59.1/100.000.

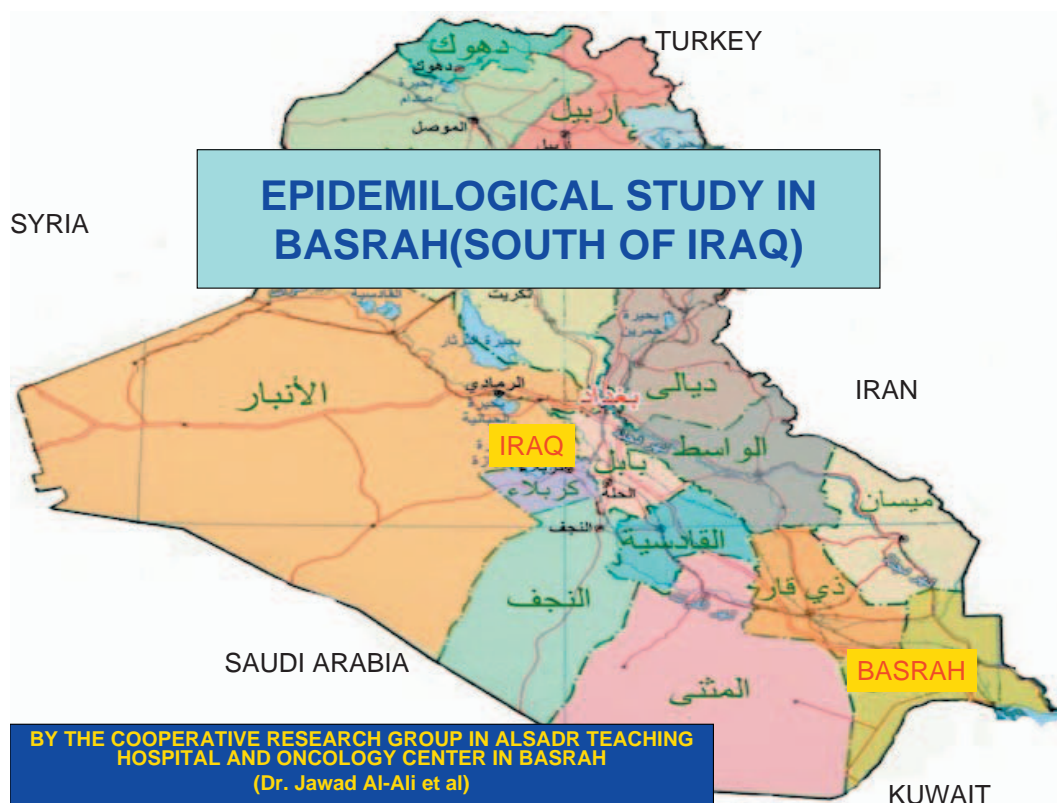
DISCUSSION AND CONCLUSIONS:

This study attempt to quantify the extent of cancer in Basrah and to give some evidence on secular changes and spatial distribution in different parts of Basrah. the authors are aware of the sever limitations of the data used. The registered cases of cancer are by no means representing the true situation in Basrah. However this limitation does not invalidate the data used.

The results indicate two important aspects of cancer in Basrah. The first is that tendency

to increase with time is evident in the overall incidence rate and in specific cancers. This increase needs further efforts to quantify in more accurate manner by improving cancer detection and registration. The second is that variation in incidence rates in different areas in Basrah is not substantial. The range of incidence rates is from 52.3 to 62.8/100.000. it might suggest that the level of risk for the population in different areas is similar. But using data for one year might be sufficient to detect true substantial differences in incidence rates and hence differences in exposure to risk factor.

In conclusion this study support the prevailing impressions and previous research findings which suggest an increase cancer risk in Basrah but solid evidence is still awaiting.

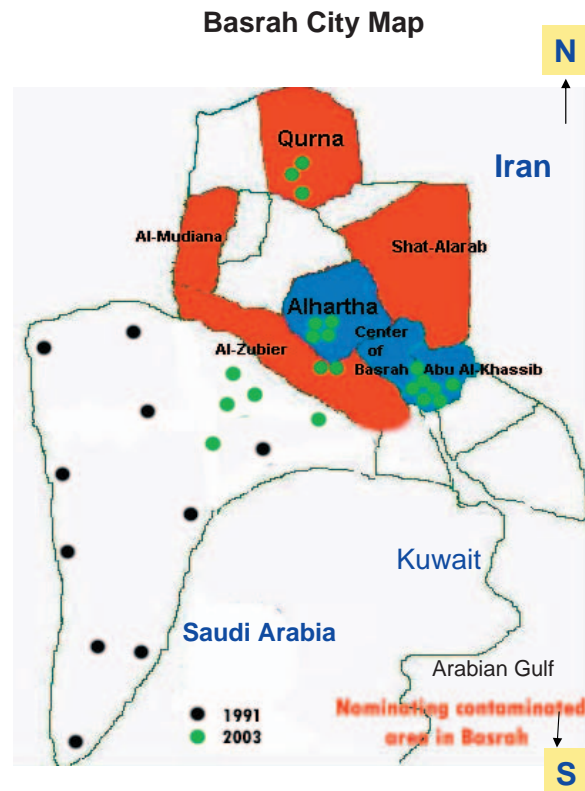


WHY CANCER EPIDEMIOLOGICAL STUDY IN BASRAH?

- To evaluate the effects of environmental contamination in the south of Iraq, (Basrah city), particularly the radiation contamination resulted from the repeated use of DU during the aggression in 1991 and 2003.
- To prove or disprove the results of the multiple individual research works on cancer rates and mortality which were criticised by other researchers and writers.
- To have a solid data base for the future studies in the field of cancer.

Introduction continue

- During gulf war 2 (1991) 140,000 tons of traditional bombs were dropped over the entire land of Iraq.
- For the first time in history Depleted Uranium weapons were used in wars.
- More than 300 tons were dropped at the western parts of Basrah.
- The estimated contaminated area was 1800 Km² and extending from Sanam mountain to North Rumaila (the oil field area).
- During 2003 (gulf war3) 1000-2000 tons of DU dropped inside the cities.
- The background levels of radiation in Basrah using LB1200 is 0.008 mR/hr.while after 2003 war the levels risen to 1.5-2 and even to 5 mR/hr.



1. Cancer is a growing problem world-wide.
2. The aetiology of many types of cancer is still obscure and the role of specific risk factors in the causation of certain cancer is unresolved.
3. Cancer distribution is not random and the reasons behind such non-randomness is not always clear.
4. In Basrah, Southern Iraq, a number of researchers carried out research work on cancer incidence and mortality during the last ten years and reported some increase in both of these two indicators.
5. However, the apparent increase could have been artificial due to better diagnosis, improved reporting and registration or reflect changes in population size.
6. Case detection and registration is incomplete and fluctuating despite the initiation of official cancer registry in Basrah for more than a decade.
7. In an attempt to improve the picture on cancer in Basrah, a team of researchers from medical and related specialties was formed. Some of the results of the joint team efforts are reported here

Sources of Data

1. Oncology Centre in Al-Sader Teaching Hospital
2. Cancer Registration Section at the Department of Pathology and Forensic Medicine.
3. Oncology Ward at Basrah Maternity and Child Hospital
4. National program for early detection of breast cancer.

Data were compiled, cleaned and entered on SPSS for analysis

RESULTS

Sources of the results

Two papers were the sources of results :

1-paper 1: (sociodemographic characteristics of cancers cases registered in Basrah in 2005).

2-paper 4: (cancer in Basrah 2005: age and spatial distribution).

Table 1 A

Age and sex composition of cancer cases registered in Basrah during 2005

Age in years	Males		Females		Total	
	No.	%	No.	%	No.	%
<5	26	3.2	27	2.7	53	2.9
5-9	34	4.2	23	2.3	57	3.1
10-14	28	3.4	19	1.9	47	2.6
15-19	22	2.7	32	3.2	54	3.0
20-24	23	2.8	34	3.4	57	3.1
25-29	26	3.2	53	5.3	79	4.3
30-34	34	4.2	50	5.0	84	4.6
35-39	34	4.2	65	6.4	99	5.4
40-44	46	5.5	106	10.5	152	8.3
45-49	47	5.8	96	9.5	143	7.9
50-54	85	10.5	143	14.2	228	12.5
55-59	68	8.4	71	7.0	139	7.6
60-64	121	14.9	126	12.5	247	13.6
65-69	73	9.0	75	7.4	148	8.1
70 and above	146	18.0	89	8.8	235	12.9
Total	813	100.0	1009	100.0	1822	100.0
Mean Age	49.2		46.0		47.4	
Median age	55		49		50	

Table 2

Total population, registered cancer cases and incidence rates per 100 000 in different parts of Basrah during 2005.

Area	Population	Registered cases	IR/100 000
Basrah City	853484	536	62.8
Northern Area	609654	319	52.3
Western Area	401481	257	64.0
Southern Area	195128	113	57.9
Eastern Area	98323	60	61.0
Total	2158070	1285	59.5

Table 3: Number of population, Number of registered cancer cases from Basrah inhabitants and age –specific incidence rates in Basrah during 2005.

Age in years	Population	Cases from Basrah	IR/100 000
<5	315 078	36	11.4
5-14	546 026	77	13.9
15-24	399 243	58	14.5
25-34	399 243	119	29.8
35-44	241 704	182	75.3
45-54	135 958	258	189.8
55-64	71 216	255	358.1
65 and above	49 636	271	546.0
Undetermined	-----	29	
Total	2158070	1285	59.5

Table 4: Distribution of cancer cases registered in Basrah during 2005 by sex and type of cancer.

Type of cancer	Males	%	Females	%	Total	%
Breast	5	0.6	285	28.2	290	15.9
Urinary Bladder	86	10.6	34	3.4	120	6.6
Lymphomas	107	13.2	81	8.0	188	10.3
Leukaemias	63	7.7	60	5.9	123	6.8
Lung	87	10.7	33	3.3	120	6.6
Colorectal	36	4.4	37	3.7	73	4.0
Prostate	25	3.1	NA	NA	25	1.4
Stomach	36	4.4	34	3.4	70	3.8
Liver	13	1.6	12	1.2	25	1.4
Ovary	NA	NA	46	4.6	46	2.5
Uterus	NA	NA	47	4.7	47	2.5
Pancreas	6	0.7	12	1.2	18	1.0
Skin	52	6.4	50	5.0	102	5.6
Soft tissue	31	3.8	15	1.5	46	2.5
Bone	26	3.2	23	2.3	49	2.7
Kidney	14	1.7	17	1.7	31	1.7
CNS	17	2.1	14	1.4	31	1.7
Thyroid	9	1.1	25	2.5	34	1.9
Pharynx/Oral cavity	21	2.6	22	2.2	43	2.4
Gall bladder	2	0.2	4	0.4	6	0.3
Abdomen	12	1.5	17	1.7	29	1.6
Testis	12	1.5	NA	NA	12	0.7
Hydatidiform mole	NA	NA	13	1.3	13	0.7
Malignant F. H. unknown origin	2	0.2	3	0.3	5	0.3
All Others	42	5.2	42	4.2	84	4.6
	109	13.4	83	8.2	192	10.3
All types	813		1009	100.0	1822	100.0
Percentage out of total cases	44.6		55.4		100.0	

CONCLUSIONS AND RECOMMENDATIONS

From the study of cancers during the year 2005 we could conclude:

- 1-There is real increase in the registered cases which reflects increased risk of cancers among inhabitants of Basrah.
- 2-In spite of the intensive one year work, it is still beyond the ability of any body to quantify the problem of cancers in Basrah precisely.
- 3-study of specific cancers should follow this epidemiological study.

TOWARDS THE BAN OF URANIUM WEAPONS

- GROUNDS FOR THE DEMAND OF A TOTAL BAN ON URANIUM WEAPONS -

Katsumi Furitsu MD. Ph. D

Member of Board and Science Team of ICBUW

Abstract of the speech at the Seminar in Helsinki, 12 Sep. 2006

ICBUW-The International Coalition to Ban Uranium Weapons was formed in October 2003. Today the Coalition is made up of around 80 members and friends from 20 countries.

Mission Statement calls for an immediate ban on the military use of uranium, so-called 'depleted' uranium (DU), and other radioactive materials. We also demand the clean-up of contaminated sites; medical assessment, treatment and compensation of the victims; independent investigation and long-term monitoring of affected populations and environment. It calls on governments to disclose locations and quantities of uranium weapons they have used. We call for the comprehensive prohibition of production, possession, testing and sale of uranium weapons. We also call on governments to exclude their troops from alliance with any government that uses uranium munitions. To ban uranium weapons we promote a Draft Convention.

Draft Convention prohibits the development, production, stockpiling, transfer and use of uranium weapons and their destruction, recalling the principles of the existing international laws as Geneva Convention. It includes clean-up of contaminated sites and compensation and care for all affected populations.

Hazardous properties of the Uranium Weapons; each in itself is a justification for ban.

1.One of the 'latest weapons' of great penetrating and distractive power. Uranium is a heavy metal and hits targets with huge energy when it is used in anti-tank shells. Uranium weapons can penetrate the armor of tanks firing with the production of high temperatures of 3000-6000 °C.

2.Weapons of radioactive materials. They are manufactured from radioactive waste materials produced during the production of nuclear weapons and the nuclear fuel chain. The radioactive half-life of U238 is 4.5 billion

years, equal to the present age of the earth. The uranium weapons are different from nuclear weapons, which use the destructive power of a nuclear explosion. The distractive power and damage from it are different both in quality and quantity between these two categories of weapons. However, both of them cause radioactive contamination and radiation exposure.

3.Weapons of hazardous ecological pollutant.

Uranium is radiologically and chemically toxic. Hazardous pollution results from every stage of production of these weapons. The aerosol of uranium oxide produced by their use spreads as far as some tens of km from the battlefields or testing sites and contaminates all of the ecosystems of the areas including that of humans.

4.Weapons of mass or indiscriminate

distractive. They affect not only military personnel but also innocent civilians, especially children, even after the wars; DU dust crosses the borders of the countries in conflicts. They are contrary to many of the existing international humanitarian laws.

Banning uranium weapons is also critical under the 'precautionary principle'. Mounting scientific evidences are warning us that we should take concrete measures, even without fully understanding every process and causal relationship between use of uranium weapons and damage to human health and the ecosystem, before it is too late. According to the 'precautionary principle' uranium weapons should be banned immediately.

Action to be taken now!

We, call on the global community to sign our International Petition to Ban Uranium Weapons and participate in the International Day of Action to Ban Uranium Weapons on November 6th. We also call on the international community to act now to support our campaign to prevent the continued chemical and radiological contamination of this, our shared Earth and our shared future.

EUROPEAN POLITICAL LANDSCAPE REGARDING THE BAN ON URANIUM (DU) WEAPONS WITH A FOCUS ON BELGIUM.

HEALTH HAZARDS

Local populations, especially children, living in areas where uranium weapons have been used, as well as soldiers who were on missions in the Balkans and Iraq, show an increase in the incidence of cancers and cancer mortality, congenital malformations, miscarriages and birth defects.

ENVIRONMENTAL POLLUTION

The US Army Environmental Policy Institute (AEPI) indicated that DU poses environmental concerns, including local water and soil contamination, which can affect human health.

They stated that the groundwater contamination, particularly when DU is spread across a land surface, should be the 'principal concern'. Soil contamination is an additional concern.¹

The Post Conflict Assessment Unit of UNEP stated in their report on Bosnia Herzegovina:

'Penetrators on the surface, and particularly those in the ground, may dissolve in time and slowly contaminate groundwater and drinking water. They may constitute a risk for future groundwater and drinking water contamination where they are close to water sources'.²

THE MILITARY DENIES THE DANGER

The military still denies there is any adverse health effect to using uranium weapons.

But the **US Army Ballistic Research Laboratory** stated in a study:

"Personnel in or near an armored vehicle at the time these vehicles were struck with DU munitions, could receive significant internal DU exposure. This study determined that an average of 79% of the airborne DU particles measured downwind of an impacted vehicle

are of respirable size (less than 10 microns in diameter), meaning that if inhaled they could become permanently trapped in the lungs."

In 2000 the authors of a report **of the Spiez Laboratory – as part of a contract with the Swiss Army-** admitted:

"DU munitions leave behind a long-lasting contamination on the battlefields, which is not compatible with civil radiation protection norms."

A scientific team of **the US Forces Radiobiology Research Institute** proved in 2002 that, under specific conditions, DU can damage the genetic material DNA and can cause carcinogenic compounds in a living cell.

Research from other institutions resulted in similar findings.

EUROPEAN INITIATIVES FOR A BAN ON URANIUM WEAPONS

On January 17th, 2001 the European Parliament (EP) resolved to call on the Member States that are also NATO members to **propose that a moratorium be placed on the use of depleted uranium weapons, in accordance with the precautionary principle** as defined in the Council resolution adopted at the European Council meeting in Nice.

The **European Parliament** adopted a resolution for a moratorium on 'the harmful effects of unexploded ordnance (landmines and cluster sub-munitions) and DU AMMUNITION on 13 February 2003.

Likewise on Feb. 13, 2003, the EP called on its executive body the **European Council**, "to support **independent and thorough investigations into the possible harmful effects of the use of depleted uranium ammunition** (and other types of uranium warheads) in military operations in areas such as the Balkans,

Afghanistan and other regions; [especially] on military personnel serving in affected areas and the effects on civilians and their land; [and called] for the results of these investigations to be presented to Parliament. (4)

On November 17th, 2005 the European Parliament issued **for the third time a call for a moratorium on the use of so-called “depleted” uranium munitions.**

The resolution regarding depleted uranium is part of an 11-page document entitled, “Texts adopted by European Parliament, on **non-proliferation of weapons of mass destruction; A role for the European Parliament**”

The Resolution’s section No. 82 says that the EP, **“Reiterates its call for a moratorium -- with a view to the introduction of a total ban -- on the use of so-called ‘depleted uranium munitions.’(5)**

In 2005 the **EP hosted the 2nd International Conference to Ban Uranium Weapons.**

ICBUW **continues lobby activities** within the EP on the different Committees to draw attention to their responsibilities regarding the DU issue, and to undertake actions.

European parliamentarians can cooperate in setting up a feedback mechanism with national parliaments, because one of the most important political aims of ICBUW is to gain **the support of one or more countries in striving for a ban.**

During **Finland’s Presidency**, we hope that Finland will play a more active role in helping to ban uranium weapons, and is willing to play a **pioneering role** in this important campaign.

BELGIUM

Mounting evidence of the radiological and chemical toxic effect of the use of uranium weapons forces us to speak out and ask our national governments and the international organizations to protect their civilians and soldiers, and to apply the precautionary principle (6)

This means that when the health of humans and the environment is at stake, it may not be necessary to wait for scientific certainty to take protective action.

The principle applies to human health and the environment. The ethical assumption

behind the precautionary principle is that humans are responsible to protect, preserve, and restore the global ecosystems on which all life, including our own, depends.

Parliamentary initiatives against DU weapons were taken by Belgian **Senators Sabine de Bethune and Erika Thijs and by Senator Lionel Vandenberghe.**

In 2005 and 2006 they introduced new law proposals that deal with uranium weapons. Unfortunately they **did not have a large enough majority** of votes to get the issue on the agenda of the Commission of Foreign Affairs and Defence.

More successful were the initiatives of **Joseph Arens and Dirk Van der Maelen**, both **members of the Chamber of Representatives**, who introduced two proposals to ban uranium weapons under Belgian law.

The arguments of the two parliamentarians convinced the president of the Commission of Foreign Affairs and Defence to organise a **hearing in the Parliament.** The hearing will take place **this autumn.** Experts from different disciplines will be invited.

Other members of the commission suggested inviting representatives from NATO and experts from the Ministry of Defence, as well as experts from the arms industry.

Representative Arens stated during the Commission of Defence meeting: **‘Belgium needs to play a pioneering role in the campaign for a worldwide ban on uranium weapons’.**

He also insisted that when one applies the Precautionary principal, irrefutable scientific evidence for links between ill health and DU exposure is not needed to implement a ban. As the Belgian Coalition, as peace activist and human rights activists, we hope to see this very soon.

September 2006

Ria Verjauw

Member of the Belgian Coalition ‘Stop uranium wapens’

ICBUW Board member –

www.bandepleteduranium.org

1. Summary Report to Congress: Health and Environmental Consequences of Depleted Uranium Use By The U.S Army U.S Army Environmental Policy Institute June 1994 <http://www.fas.org/man/dod-101/sys/land/docs/du.html>
2. Depleted Uranium in Bosnia and Herzegovina Post-Conflict Environmental Assessment, Revised Edition May 2003 http://postconflict.unep.ch/publications/BiH_DU_report.pdf
3. Thursday 17 November 2005 - Strasbourg Provisional edition Weapons of mass destruction P6_TA-PROV(2005)0439 A6-0297/2005 European Parliament resolution on non-proliferation of weapons of mass destruction: A role for the European Parliament (2005/2139(INI))
4. Feb. 13, 2003 text of resolution <http://www.europarl.eu.int/omk/sipade3?PUBREF=-//EP//TEXT+TA+P5-TA-2003-0062+0+DOC+XML+V0//EN&L=EN&LEVEL=2&NAV=S&LSTDOC=Y&LSTDOC=N>
5. Nov. 17, 2005: text of resolution <http://www.europarl.eu.int/omk/sipade3?PUBREF=-//EP//TEXT+TA+P6-TA-2005-0439+0+DOC+XML+V0//EN&L=EN&LEVEL=0&NAV=S&LSTDOC=Y&LSTDOC=N>
6. *The 1998 Wingspread Statement on the Precautionary Principle summarizes the principle this way: "When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." All statements of the Precautionary Principle contain a version of this formula: When the health of humans and the environment is at stake, it may not be necessary to wait for scientific certainty to take protective action The principle applies to human health and the environment. The ethical assumption behind the precautionary principle is that humans are responsible to protect, preserve, and restore the global ecosystems on which all life, including our own, depends.* <http://www.sehn.org/ppfaqs.html>

DU: IS IT A HEALTH HAZARD?

KEITH BAVERSTOCK
UNIVERSITY OF KUOPIO
KUOPIO, FINLAND

THIS IS A COMPLEX QUESTION

There are many aspects to this question and there has been a tendency for them to be conflated thus leading to confusion. I would like to clarify these issues in order to try and bring some resolution to the debate concerning the case for a moratorium or ban on the use of DU weapons.

WHAT DU WEAPONS ARE NOT

- They are not **nuclear** weapons although they contain uranium; no fission or fusion takes place when they are used.
- They are not **WMD**; they are potentially indiscriminate but there is no evidence that they are mass killers as would be a nuclear weapon.
- They do not produce an infinitely persistent **metal gas**; they do produce nano-sized particles which have specific properties when inhaled.

AFTER FIRING, DU MUNITIONS

- that do not hit a target may become buried the ground and slowly dissolve into ground water (over hundreds of years)
- that hit a target (tank, building, bunker) fragment and burn leaving a residue of airborne smoke and dust that deposits intensively close to the target and to a lesser extent further a field, and residual unburnt fragments and shards.

THERE ARE TWO CATEGORIES

- ... of persons potentially affected, namely;
- military personnel engaged on the battlefield during and immediately after hostilities, and
- civilians inhabiting former battlefield sites whose water supplies may be contaminated by buried DU metal and whose air may be contaminated by re-suspended DU oxide dust.

IT IS THIS CIVILIAN CATEGORY ...

... that I think should be of most concern and that concern is most acute where the exposure is by inhalation to the DU oxide dusts which have a soluble component. The increased concentration of uranium in ground water from unburned munitions is unlikely to be a public health problem as most ingested uranium is excreted without entering the bloodstream.

THE KEY RISK ASSESSMENT ..

- ... in respect of the civilian hazard is by the WHO in April 2001. However, this report does not address;
- the specific properties of DU oxide dust, in particular its solubility,
- its potentially genotoxic effect, and
- the potentially synergistic interaction between the acknowledged chemical and radiological toxicities.

IN FACT WHAT WHO DOES:

- In respect of radio-toxicity is regurgitate the position taken by the ICRP in 1990 on insoluble particulates that might be inhaled, for example, in the processing of uranium for nuclear fuel, and
- In respect of chemical toxicity focus on impairment of kidney function with minimal attention given to reproductive, neurological and developmental toxicity and carcinogenesis.

EXPLICITLY AND KNOWINGLY IGNORED ...

..... is the body of evidence mainly, in 2001, accrued by AFRRRI on the genotoxic effects of DU in cells in culture. This demonstrates that cells exposed DU are induced to exhibit the kind of damage to their genetic material

associated with malignancy, for example mutations, genomic instability, modified gene expression, etc..

SUCH MODIFIED CELLS ...

..... exhibit many of the properties of malignant cells such as:

- changed morphological appearance
- anchorage independent growth, and
- can result in malignancies when injected into normal animals.

Nickel behaves very similarly in these experiments and is a confirmed carcinogen.

ALTHOUGH THERE IS

.... no direct epidemiological evidence that DU is (although there is some evidence that U is) carcinogenic (arguably since the first exposures were less than 20 years ago there has been insufficient time for these to be visibly manifested) the fact that DU has genotoxic properties and human exposure to it is without precedent, are reasons enough to invoke the **precautionary principle**.

IN SUMMARY:

- Use of DU munitions results in extensive environmental contamination by uranium

oxide dusts that are respirable on re-suspension.

- Uranium is an established toxin if it enters the bloodstream
- Inhaled DU dusts are potentially able to enter the bloodstream i.e. are bioavailable

THUS:

- land contaminated by DU oxide dusts must be regarded as posing a health risk to the public that inhabits it. This is the more so where the climate is dry and arid and the dust particles remain on the soil surface and are available for resuspension. From what is known about the behaviour of uranium in the body the tissues most at risk are, lung, bone, bone marrow and kidney and the lymphatic system.

THE RISK MAY BE:

- from the chemical properties of uranium as a heavy metal,
- from the radioactivity, either directly or through the bystander effect, or
- from the combined chemical- and radio-toxicities, either additively or multiplicatively. These are issues for which there are no answers at present.

THE IRAQI CHILDREN'S TOOTH PROJECT

Following the use of depleted uranium munitions in the Gulf Wars of 1991 and 2003, many populated areas of Iraq became contaminated with fine uranium oxide dusts that are readily respirable. This contamination represents a public health concern because uranium is known to be a mutagen, a carcinogen, a teratogen (an inducer of birth defects), a neurotoxin and a kidney toxin. Although substantial increases in cancer and birth defects have been reported in Iraq after the 1991 war, there are virtually no data on the extent to which Iraqi civilians have sustained internal contamination from the environmental uranium derived from depleted uranium munitions. Everyone has trace levels of uranium in their body and most of this uranium is stored in bones and teeth. Consequently, the primary teeth or deciduous teeth, that children normally lose between ages 5 and 12 years, represent valuable biologic specimens that can be used to study a child's uranium burden. In this project, teeth have been collected from Iraqi children living in or near areas in south or central Iraq that are known to be contaminated with depleted uranium. These teeth will be analyzed for total uranium content as well as the content of four uranium isotopes: ^{238}U , ^{235}U , ^{234}U and ^{236}U ; the resulting data will be compared to similar results obtained from teeth collected from children living in areas (Northern Iraq and North America) which are not contaminated with depleted uranium.

Abnormally low contents of ^{235}U and ^{234}U in a child's tooth and/or the presence of detectable amounts of ^{236}U will constitute very strong evidence that the child has incorporated depleted uranium into his/her body. The analytical methods to be used in this project are sufficiently sensitive to detect the incorporation of depleted uranium levels as low as 1% of the total uranium present in a tooth.

INTRODUCTION AND BACKGROUND

Many populated areas of south and central Iraq are contaminated with uranium oxide dust from depleted uranium (D.U.) munitions. This is a

serious public health concern because it is clear from the medical and scientific literature that uranium is a mutagen, a carcinogen, an inducer of birth defects (a teratogen), a neurotoxin and a kidney toxin. Indeed, increases in birth defects and in cancer and leukemia (especially among children) have been reported in south and central Iraq following the use of D.U. munitions in 1991 and 2003. Many believe that inhalational exposures to D.U. dust may have contributed to these increases in cancer and birth defects. Establishing a causal link between D.U. exposure and adverse health effects will require information on how much D.U. is getting into the bodies of Iraqis who live in areas contaminated with D.U. Lamentably, no such information is currently available. These considerations have led to "The Iraqi Children's Tooth Project".

This tooth project is based on the following principles:

- 1.) We all have trace amounts of uranium in our bodies and most of this is stored in our bones and teeth. Consequently, the "baby teeth" which children normally lose between age 5 and 12 are very useful specimens for analyzing stored uranium; these teeth can be obtained without any invasive procedure and they are readily stored and transported.
- 2.) In contrast to the natural uranium which may be present at very low levels in rocks and soil, the uranium oxide dust derived from D.U. munitions contains much higher concentrations of uranium (at least 100,000 times more uranium). Moreover, D.U. dust particles are quite small and much more readily inhaled and therefore are vastly more "bioavailable". Consequently, we anticipate that some teeth collected from children living near heavily contaminated areas might have high contents of DU.
- 3.) Uranium samples everywhere in this solar system have precisely the same composition of uranium isotopes. In contrast, depleted uranium has a distinctly abnormal composition of uranium isotopes (see TABLE below).

	Natural Uranium	Depleted Uranium
²³⁸ U	99.275%	~99.8%
²³⁵ U	0.720%	~0.2%
²³⁴ U	0.005%	~0.001%
²³⁶ U	ZERO!	~0.003%

As its name indicates, depleted uranium is depleted in Uranium-235 and Uranium-234; moreover, D.U. contains Uranium-236, an isotope that does not exist in nature, but is formed only in nuclear reactors. This is so because some of the depleted uranium used to make D.U. weapons is reprocessed from nuclear waste. These two properties of D.U., namely, abnormally low levels of Uranium-235 and Uranium-234 and detectable levels of Uranium-236 can be used as chemical signatures or molecular markers for D.U. These two properties allow the detection of D.U. even within mixtures of natural uranium and depleted uranium. In this research project, if only 1% of the total uranium in a child's tooth was depleted uranium, the resulting isotope composition would be sufficiently abnormal to be detected mass spectrometry.

Although this project is based on well established principles of physics and chemistry, it is novel in that, to date, there have been no published studies which assess exposure to depleted uranium (or enriched uranium) by analyzing uranium isotopes in teeth. This tooth project is quite distinct from standard children's tooth projects which measure the strontium-90 content of teeth; in particular, this project will be substantially more costly.

PROJECT DESIGN

To investigate the extent to which Iraqi children have incorporated depleted uranium into their primary teeth, Iraqi public health physicians

have collected teeth from a total of 52 children living in three different areas:

- 16 from southern Iraq which has been contaminated for 15 years;
- 24 from central Iraq which has been contaminated for 3 years and
- 12 from northern Iraq which presumably has not been contaminated with DU.

Detailed demographic data on these 52 Iraqi children can be found in the Table on the next page.

In addition to the "control teeth" from northern Iraq, we also will analyze 15 teeth collected from North American children and 15 "archeological teeth" that is, teeth obtained from individuals who died 3,000 to 4,000 years ago and therefore could not possibly have incorporated any depleted uranium [or enriched uranium] into their teeth.

We hope that the results of this study will warrant publication in an elite international medical journal. If we find that some Iraqi children have been contaminated with DU, this will have an impact on the international public health community since uranium is documented to be a mutagen, a carcinogen, a teratogen [an inducer of birth defects], a neurotoxin and a kidney toxin.

This project, "Measurement of Uranium Isotopes in Children's Teeth", is registered at the Mount Sinai School of Medicine's Grants and Contracts Office and was assigned the following project number: GCO#05-0505. This project has been approved by the Mount Sinai Institutional Review Board which reviews all research projects involving human subjects; it also has been approved by the Ethics Committee of the Al Mustansiriya University College of Medicine in Baghdad.

IRAQI CHIDREN'S TEETH – DEMOGRAPHIC DATA

No.	Age/y.	Sex	Residence	Governorate	Prev. Resid.
1	6	M	Rusafa	Baghdad	Same
2	12	M	Kasrah	Baghdad	Same
3	9	F	Sarrafa	Baghdad	Same
4	10	F	Huriya	Baghdad	Same
5	9	F	Shurta 4	Baghdad	Same
6	5	M	Saddam camp	Baghdad	Same
7	11	M	Tabook	Baghdad	Same
8	10	M	Tabook	Baghdad	Same
9	11	F	Assalam	Baghdad	Same
10	9	F	Aljihad	Baghdad	Same
11	12	M	Hamraa	Baghdad	Same
12	11	M	Hamraa	Baghdad	Same
13	8	F	Hilla	Babil	Same
14	7	F	Hilla	Babil	Sama
15	6	F	Hashimia	Babil	Same
16	9	M	Hilla	Babil	Same
17	6	F	Hilla	Babil	Same
18	8	F	Hilla	Babil	Same
19	6	F	Hilla	Babil	Same
20	8	M	Hilla	Babil	Same
21	6	F	Hilla	Babil	Same
22	8	M	Mosul	Ninawa	Same
23	10	F	Mosul	Ninawa	Same
24	11	M	Mosul	Ninawa	Same
25	9	F	Shatra	Thiqar	Same
26	8	F	Shatra	Thiqar	Same
27	12	M	Shatra	Thiqar	Same
28	10	F	Shatra	Thiqar	Same
29	8	F	Nasiriya	Thiqar	Same
30	10	F	Karbalaa	Karbalaa	Same
31	10	F	Karbalaa	Karbalaa	Same
32	6	M	Karbalaa	Karbalaa	Same
33	11	M	Alsair	Basrah	Same
34	7	F	Door alshon	Basrah	Same
35	9	F	Alsair	Basrah	Same
36	4	M	Kut alhajaj	Basrah	Same
37	8	M	Nasran	Basrah	Same
38	10	F	Qurna	Basrah	Same
39	5	M	Natran	Basrah	Same
40	7	M	Alsair	Basrah	Same
41	7	F	Alsair	Basrah	Same
42	8	F	Natran	Basrah	Same
43	12	M	Natran	Basrah	Same
44	7	M	Azadi	Duhok	Same
45	7	M	Nazarke	Duhok	Nesra/Duhok
46	10	F	Azadi	Duhok	Baghdad
47	9	F	Azadi	Duhok	Same
48	8	M	Azadi	Duhok	Same
49	10	M	Shendokha	Duhok	Same
50	5	F	Baroshke	Duhok	Same
51	5	M	Baroshke	Duhok	Same
52	5	M	Spendare	Duhok	Same

PROJECT PERSONNEL

1.) Out of concern for their personal safety, the three Iraqi public health physicians who collected the teeth for this project, are not being identified at this time.

2.) Randall R. Parrish, Ph.D.
Professor of Geological Chemistry
University of Leicester, England
Head, Isotope Geoscience Laboratory
British Geological Survey
Natural Environment Research Council
Kingsley Dunham Centre
Keyworth, Nottingham NG12-5GG, UK
Dr. Parrish will use multi-collector, inductively coupled plasma mass spectrometry (MC ICP MS) to analyze teeth for their content of four uranium isotopes: ^{238}U , ^{235}U , ^{234}U and ^{236}U .

3.) Abdulla Al-Shorman, Ph.D.
Assistant Professor of Physical Anthropology
Faculty of Anthropology and Archaeology
Yarmouk University
Irbid, Jordan
Dr. Al-Shorman will provide archeological teeth collected from various sites in Jordan; these teeth will serve as the "gold standards" for this study.

4.) Thomas M. Fasy, M.D., Ph.D.
Associate Clinical Professor of Pathology
Mount Sinai School of Medicine
New York, NY
Dr. Fasy has collected control teeth from children living in New York City, Toronto and Eastern Pennsylvania. He has conducted reviews of the uranium toxicology literature and is raising funds to support the current tooth project.

Professor Randy Parrish, a geological chemist at the Univ of Leicester in England, will be analyzing the teeth. Dr. Parrish has been using state of the art technology to precisely measure uranium isotopes in geological specimens for more that two decades; he has been involved in measuring uranium isotopes in biological specimens for more than five years. For an excellent overview of the rationale and procedures for analyzing uranium isotopes in human urine, see Professor Parrish's PowerPoint presentation:

http://www.nuclearpolicy.org/documents/parrish_jun_14_03.pdf

Dr. Abdulla Al-Shorman is a physical anthropologist at Yarmouk University in Irbid, Jordan. Dr. Al-Shorman is interested in environmental dynamics of prehistoric times; he has analyzed isotopes of carbon and of oxygen in prehistoric human teeth and, from the resulting data, made inferences about climate, temperature and diets prevalent in the periods involved.

Dr. Al-Shorman has access to a large number of prehistoric human teeth collected at various archeological sites in Jordan. Approximately fifteen of these teeth, which could not possibly contain depleted uranium or ^{236}U , will serve as additional controls in this study.

Dr. Tom Fasy joined a group of US academics that visited Baghdad in mid-January and late June of 2003. Dr. Fasy has participated in several conferences on depleted uranium weapons; he met Dr. Randy Parrish at two such conferences in June 2003 and April 2004 and most recently during a visit to Dr. Parrish's lab in June 2005.