特別報告 1

CANCER TREND IN BASRAH AFTER GULF WARS

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Introduction

War destroys every thing, only not causing trauma only, but also poisoning atmosphere and/or hydrosphere. Life is totally dependent on air and water, therefore; poisoning of these resources will cause mass destruction and killing all lives.

The life in Iraq has been struck many times and in different ways. For example, it was well recognized that during 1991 through 2003, depleted uranium (DU) ammunition was used extensively and mainly in the south of Iraq, in and around Basrah city. Basrah city and the surrounding areas are inhabited by approximately 2 million citizens.

Uranium is a naturally occurring, ubiquitous heavy metal found in various chemical forms in all soils, rocks, seas and oceans. It is also presents in drinking water and food. Natural uranium consists of a mixture of three different isotopes: ^{238}U (99.27% by mass), ^{235}U (0.72%) and ^{234}U (0.0054%). On average, about 90 μg exist in the human body from the normal intake of water, food and air ; of which 66% is found in the skeleton, 16% in the liver, 8% in the kidneys and 10% in other tissues[1].

Uranium is used primarily in nuclear power plants; most reactors require uranium in which the ^{235}U content is enriched from 0.72 to about 3－4%. The uranium remaining after removal of the enriched fraction is referred to as depleted uranium(DU). DU typically contains about 99.8% (by mass) of ^{238}U, 0.2% of ^{235}U and 0.0006% of ^{234}U. For the same mass, depleted uranium has about 60% of the radioactivity of the natural uranium[2,3].

Like naturally occurring uranium, DU is an unstable, radioactive, heavy metal which emits ionizing radiation of three types : alpha, beta and gamma. Because of its radioactivity, the amount of uranium in a given sample decrease continuously but the half life so-called is very long－4.5 billion years in case of the isotope ^{238}U. In practice, therefore, the level of radioactivity does not change significantly over human life time[4].

Depleted uranium has a number of civilian applications. It is employed in counterweights or ballasts in aircraft; radiation shields in medical equipment; as containers for the transport of radioactive material and as chemical catalysts. DU also has been used in glassware and ceramics (as cooking and serving containers) as well as dentistry. In addition, depleted uranium has military applications due to its physical properties (e.g. its density that is about twice as high as that of lead). DU is used in munitions designed to penetrate armor plates and is also used to reinforce military vehicles, such as tanks[5].

DU is toxic to humans and animals for two basic reasons: as a heavy metal, it has toxic chemical

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effect, and as an α-emitter, it has radioactive effect. Although, it is considered less radioactive than natural uranium, its toxicity is highly due to linear-energetic transfer (LET) irradiation, tissue deposition (in bones, kidneys, blood, lungs), and elimination time (5000days).The radiation limit depends on the quality and the contamination time, including other factors such as age, sex, previous health status, exposure to other materials, genetic predisposition and radio-sensitivity, diet, and stress[6].

In low level exposure there are no difference for the risk of disease. However, 5－10% of the population is naturally radio-sensitive, and all radioactive doses above the natural level can produce biological effect. The biomarkers of effects and radio-sensitivity are blood cells especially lymphocytes and chromosomes[7.8].

DU can expose people to radiation from the outside (external radiation) and from the inside (internal radiation) if DU has passed into the body by inhalation or ingestion. The harmful effect of such radiation is mainly an increased risk of cancer, with the magnitude of risk depending on the means of exposure and on the radiation dose[4].

Local situation and Interpretation

In Basrah, there has been a noticeable increase in incidence of cancer cases both in adults and children[9.10]. Between 1997－98, it was registered 4x rise in new cancer cases per year compared to 1988－90, including a high proportion of childhood leukemia and lymphoma, and by the year of 2003 the registration increased to more than 9-fold (Table I). The shift to younger age group was significantly noticed among leukemic children (Table II).

Analysis of the histopathological reports issued in Basrah Teaching Hospital for the years 1990 and 1997 showed a marked rise (160%) in the new cases of uterine cancers,143% rise in thyroid cancer,102% rise in breast cancer and 82% rise in lymphoma (Table III). There was shift in the age distribution of cancer cases towards younger age group. In 1990, only 22.7% of the cases were among young adults (15－44),compared to 31.6% of cases in 1997[9]. That was well recognized among females with breast cancer, with at least one case was as young as 14years, and we also reported 4-year and 6-year girls with uterine and ovarian cancers respectively*.

On the other hand, the cancer deaths have increased by a factor of almost 9x by 1998 and 19x by 2002 (Figure I)**.

Table Ⅰ. Malignant disease among children in Basrah for the period1993－2003[10]

Cancer／Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Leukemia	15	14	25	24	24	24	30	60	70	85	94
Lymphoma	4	1	5	8	8	9	19	13	18	35	40
Brain Tumor	4	3	2	5	6	2	2	3	3	7	5
Wilms tumor	3	2	4	1	0	0	3	0	0	6	8
Neuroblastoma	0	0	0	0	3	4	6	3	2	12	10
Others	1	1	0	0	2	3	5	13	7	15	26
Total	27	21	36	38	42	42	65	92	100	160	183

Data in the table renewed by Dr Genan G. H.

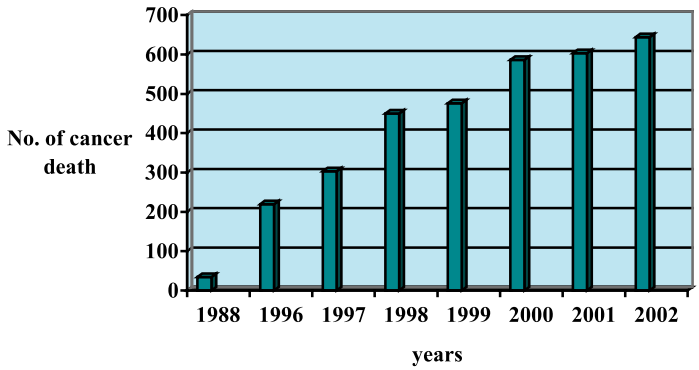
Table Ⅱ. Proportion of leukemia in children<5years[10]

Year	total leukemia	leukemia in age< 5	%
1990	15	2	13.3
1994	14	5	35.7
1998	24	10	41.7
2000	60	34	56.7

Table Ⅲ : The distribution of cancers according to the site in 1990 and 1997 (pathology department/Basrah Teaching Hospital)[9]

Site	1990		1997	
	No.	%	No.	%
Bladder	58	11.9	47	8.6
Breast	49	10	99	18.2
Lymphoma	22	4.5	40	7.4
Skin	54	11.1	38	7
Lung	30	6	18	3.3
Larynx	28	5.7	23	4.2
Colon & rectum	26	5.3	27	5
Stomach	25	5.1	19	3.5
Bone	17	3.5	17	3.1
Uterus	15	3.1	39	7.2
Liver	15	3.1	18	3.3
Ovary	12	2.5	9	1.7
Soft tissue	12	2.5	11	2
Oral cavity	12	2.5	4	0.7
Kidney	11	2.3	7	1.3
Pharynx	11	2.3	16	2.9
Prostate	9	1.8	4	0.7
Brain	9	1.8	13	2.4
Thyroid	7	1.4	17	3.1
Others	66	13.5	78	14.3
Total	488	100	544	100

Figure Ⅰ : Death among Patients with Cancers in Basrah [Al-Ali data]

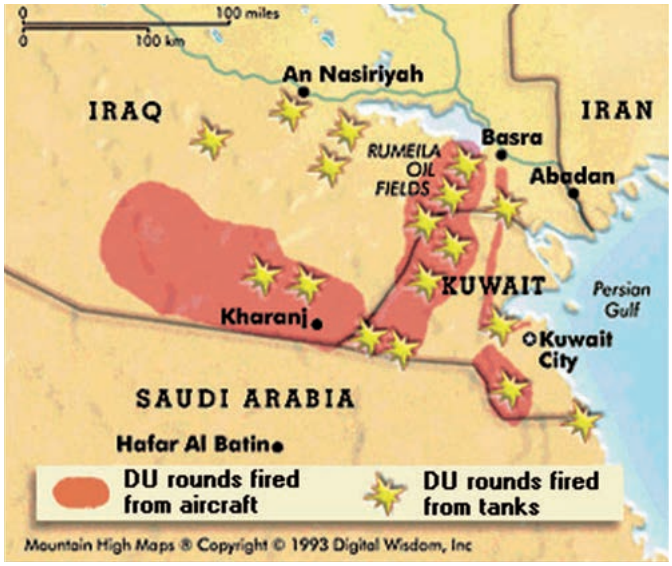


*.**.***Al-Ali

The rise in cancer, is it real?

The phenomenal increase in the number of newly diagnosed cancers in Basrah during 90s and thereafter, as well as the most striking changes in the pattern of cancer mortality have raised a question about what is are going on in this area. Cancer-phobia, now, is the most common chief complaint of the patients. So it is obvious for the general population, rather than oncologists, that the trend of cancer is increased in a noticeable way. Actually, we can say that this remarkable increase is unlikely to be just a simple reflection of population increase during the last 15years. First; the annual population increase rate was almost the same for the last thirty years; yet, the significant rise in cancers seems to have been particularly rapid since the end of 1995. Second; the population has doubled, but the cancer registry reported 9-fold increase in cancer among children by the year 2003 as compared to 1990; and most of the new cancer cases came from areas immediately to the east of the main GW battlefields (Figure II).

Fig. Ⅱ : Radioactive battlefields in Kuwait and Iraq GW 1991



Improved registration could partly explain the increase in cancers. However, it could not explain the continuing rise even during the last 8 years or so, when the level of registration is almost the same. In addition, increased mortality due to cancers was substantial during the last ten years and this increase is very likely to reflect both increased incidence and case fatality. It is unlikely to reflect improved registration of deaths because death registration in Iraq is both compulsory and nearly complete with few exceptions.

Lastly, the increased incidence of cancer could not reflect improved diagnosis during the last 15 years, given the restrictions due to economic embargo on Iraq till 2003. Indeed, we believe that tangible part of the increased risk of cancer must reflect real exposure to risk factors including the possibility of excess exposure to radiation as we shall see in the following sections.

What are possible causes of the increase?

Causes of cancer are multifactorial which involve in addition to inherited predisposition, such environmental factors as chemicals, ionising radiation and oncogen virus[7].

Although there is a new phenomenen in 1990s, of reporting cancers in families (familial clustering***), but the data showing that the cancer increase is not true for all areas in similar density, and therefore strongely implicated a local factor(s). Hence, the environment rather than genetic factors plays the principal role in causing the increased cancers in the area.

The state of Iraq's environment has been influenced by decades of armed conflict, strict economic sanctions and the absence of environmental management principles in national planning. During 1991 a massive air campaign targeted Iraqi military forces and infrastructure, as well as numerous other sites including oil refineries, electrical power stations, and petrochemical facilities. DU was reportedly used extensively in the vicinity of Basrah during the Gulf Wars.

This may involve any or all of the following potential risks to the environment and human health, based on UNEP's findings in the Balkans:

- Inhalation of DU dust at the time of munitions impact, leading to a potentially serious additional health risk to anyone in the immediate vicinity who survived the initial blast and subsequent fire;
- Widespread, low-level contamination of the ground surface by DU;
- Presence of intact DU penetrators have been buried in soft ground (which might be dug up and handled by unprotected individuals, leading to a low-level but unnecessary beta radiation dose to the skin) ;
- Presence of DU penetrator fragments on the ground surface (which might be picked up and handled by unprotected individuals, including 'souvenir' hunters, leading to a low-level but unnecessary radiation dose) ;
- Possible migration of DU into ground water (and from there into drinking water supplies), through corrosion and dissolution of penetrators and penetrator fragments.

The return to normal activities in an area where DU munitions have been deployed will include children playing. This may be in areas where derelict military equipment remains. The hand to mouth and inquisitive activities of children may lead to significant dermal contact with metal fragments and dust. Ingestion of contaminated dust and soil will be likely and ingestion of contaminated food and water may also occur. Secondary mobilization of fine contaminated particles may also increase potential exposure from inhalation[11].

Dr. Guenther carried out extensive studies in Iraq between 1991 and 1997. Their results produced ample evidence to show that contact with DU ammunition has the following consequences, especially for children[12].




Destroyed Iraqi tank

- Considerable increase in infectious diseases caused by severe immunodeficiencies in a great part of the population
- Frequent occurrence of massive herpes and zoster (shingles) afflictions
- AIDS-like symptoms
- Renal and hepatic dysfunction (as early as the end of 1991)
- Leukemia, aplastic anemia (bone marrow failure to produce blood cells), and malignant tumors
- Congenital heart deformities caused by genetic defects found in both humans and animals.

DU as a carcinogen, is it myth or truth?

In a recent study[13], immortalized human osteoblastic (new bone formation) cells were exposed to DU－uranyl(UO_2)$^{2+}$ ions in vitro. Only 1 in 70,000 cell nuclei was hit by alpha particles. Nevertheless, the uranyl ions were able to transform these cells to the neoplastic (cancer) cells. The transformed cells were characterized by anchorage-independent growth, tumor formation in nude mice, high levels of oncogenes, reduced production of the tumor-suppressor protein, and elevated levels of sister chromatid exchanges.

DU-uranyl chloride (UO_2Cl_2) treatment resulted in a (9.6 ± 2.8)-fold increase in transformation frequency compared to untreated cells. In comparison, nickel sulfate ($NiSO_4$) resulted in a (7.1 ± 2.1)-fold increase in transformation frequency. The implication is that the risk of cancer from internalized DU may be comparable to other biologically reactive and carcinogenic heavy metals[13].

A case control study[14] of cancer cases in Iraqi military personnel, showed increased registration of different types of cancers and change in the epidemiological pattern of their occurrence with time among the patients who were involved in southern region during the Gulf War in 1991 (Tables IV and V). There were significant correlation and association between cancers and DU. The odd ratios of lymphoma and leukaemia were highly significant, 5.6 and 4.8 respectively (Table VI).

Robert Fisk, a respected British journalist on Middle East, reported in 1998 a cancer “epidemic” of leukemia and stomach cancer in southern regions of Iraq claiming the lives of thousands of Iraqi civilians, including children so young that they were not even born when hostilities ended[15.16.17].

Table Ⅳ: Different types of cancers which had been registered in 1990 and 1997 of military personnel who participated and exposed to explosion in the battlefield.[17]

Type of Cancer/Year	1991		1997	
	No.	%	No.	%
Lymphoma	10	34.5	82	29.4
Leukemia	10	34.5	40	14.3
Lung CA	4	13.8	40	14.3
Brain CA	1	3.4	34	12.2
Gastrointestinal CA	2	6.9	10	3.6
Testis CA	0		15	5.4
Bone CA	2	6.9	15	5.4
Pancreas	0		15	5.4
Salivary gland	0		15	5.4
Liver	0		13	4.5
Total	29	100	279	100

Table Ⅴ: Different types of cancers which had been registered in 1990 and 1997 of military personnel who participated but not exposed to explosion in the battlefield.[17]

Type of Cancer/Year	1991		1997	
	No.	%	No.	%
Lung CA	2	66.7	14	35.9
Leukemia	1	33.3	6	15.4
Lymphoma	0	0	6	15.4
Bone CA	0	0	3	7.7
Brain	0	0	10	25.6
Total	3	100	39	100

Table Ⅵ: Odd ratios of different types of cancers (the numbers referred to all−cases and control−between 1991 and 1997)[17]

Type of cancer	Exposed		Unexposed		Odds ratio
	Cases	Control	Cancer	control	(R.R)
Lymphoma	449	643	44	351	5.6
Leukemia	311	573	48	429	4.8
Brain CA	162	183	23	114	4.5
Liver CA	36	46	36	97	2.5
Bone	57	91	27	87	2
Gastrointestinal	66	125	65	177	1.4
Lung CA	210	627	78	357	1.4
Total	1425	2894	315	1112	1.7

In addition to the experimental studies, the establishment of causal relationship between cancer among human and certain risk factor is mostly based on epidemiological studies. The above presented findings supporting the hypothesis that the increased incidence of cancer could be attributed to the exposure to DU in and around Basrah city. The fact that depleted uranium was used has been confirmed by measuring the levels of radioactivity of samples taken from different parts of the battlefields and Basrah city[18.19]. The results revealed that the radioactivity was above the background level in such an extent proportionated with the distance from the target hit by DU munition.

On the other hand, the disturbing trend of increased cancers has detected 4－5 years after the Gulf War in 1991,corresponding to the latent period of cancer (e.g. leukemia) after exposure to radiation[9]. The changing age structure of cancer cases with a shift towards the younger age group further supports our hypothesis, and the pattern described is consistent with a ”common source outbreak” which is in this case exposure to ionizing radiation[10].

Finally, I think it is worthly to mention that even oxygen which makes up roughly 20% of atmosphere and which is fundamental to life, is toxic to humans if they are exposed to it at higher than atmospheric level.

But the question is still not completely answered, and it is difficult to prove “cause and effect” based on epidemiological studies lacking of independent measures of exposure such as tissue and urine samples, no control city for comparison, and mobile population. In addition to that, it is still important to consider such factors as the presence of collapsed sewege treatment systems mixed with industerial waste, poor water supply, absent or inefficient collection system of domestic waste...etc. These and other factors that are causing environmental pollution should be taken in consideration in the incoming studies.


The accumulation of waste in urban areas, as here in Basra, poses a direct threat to human health


People collecting water in Basra


Pollution of surface waters is a major problem throughout Iraq


Numerous destroyed and damaged military vehicles were abandoned in Kuwait after the 1991 Gulf War, posing a major clean-up challenge

Conclusion and recommendation

The cancer trend to increase in post-war Iraq, particularly in the most targeted area. The increase was in such a fearable way as causing cancer phobia among general population. The disturbing increase is still growing in a linear pattern with time. It could be attributed, based on clinical and epidemiological data, to the environmental and individual contamination by DU. But we need more sophisticated studies to prove the cause and effect relationship.

Then I think it is valuable to enumerate the steps put by Desk Study[13] as recommendation :

1. Assess the situation on the ground and identify technical priorities for mobilizing environmental assistance.
2. Relieve environmental threats to human health and wellbeing.
3. Integrate environmental protection into the wider post-conflict reconstruction process.

4. Create the knowledge base for addressing the chronic environmental problems confronting Iraq.
5. Action to build strong national institutions and capacities for long-term sustainable management of the environment.

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References

1. Priest, N.D.,1990. The distribution and behaviour of metals in skeleton and bodies : studies with bone seeking radionuclides. In : Priest, N.D., Van de Vyver, F.(Eds.), Trace Metals and Fluride in Bones and Teeth. CRC Press, Boca Raton, pp.83－140.
2. AEPI, 1995. Health and environmental consequences of depleted uranium use in the US Army. Technical report. US Army Environmental Policy Institute, Atlanta, June1995.
3. Cantaluppi, C., Degetto, S., 2000. Civilian and military uses of depleted uranium : environmental and health problems. Annali di Chimica (Rome) 90, 665－676.
4. UNEP, 2002 : Depleted uranium in Serbia and Montenegro. Post－Conflict Environmental Assessment. Nairobia 2002.
5. Maria Betti. 2003. Civil use of depleted uranium. Journal of Environmental Radioactivity 64 (2003) 113－119.
6. Durakovic, A.,1999. Medical effects of internal contamination with uranium. CMJ, 40, pp.1－18,www.mefst.hr/cmj/1999. htm
7. Tembrell, J. A., 2001. Introduction to toxicology,3rd edition. Taylor & Francis, London.
8. Harvey, L., Brek, A., Zipursky, S.L., Matsudaria, P., Baltimore, D., Darnell, J., 2001. Mollecular cell biology, 4th edition, Media Connected. Freeman, New York.
9. Alim A－H. Yacoub, Narjis A－H Ajeel, & Mohammed Al－Wiswasy. Incidence and pattern of malignant diseases (excluding leukemia) during 1990－1997. Medical journal of Basrah University.1999 ; 17.
10. Alim A－H Yacoub, Imad Al－Sadoon, Genan G. Hassan & Muffid Al－Hemadi. Incidence and pattern of malignant disease among children in Basrah with specific reference to leukemia during the period 1990－1998. Medical journal of Basrah University. 1999 ; 17.
11. UNEP, 2003. Desk study on the environment in Iraq. 2003.
12. S.－H. Guenther : How DU Shell Residues Poison Iraq, Kuwait and Saudi Arabia ; Metal of Dishonor, International Action Center, (May 1997).
13. A. C. Miller, W. F. Blakely, D. Livengood et al. Transformation of Human Osteoblast Cells to the Tumorigenic Phenotype by Depleted Uranium－Uranyl Chloride ; Environmental Health Perspectives, Vol.106, (August 1998).
14. Al－Ani. Health consequences of DU used by US and British forces. Baghdad medical college 1998.
15. R. Fisk : Allies Blamed for Iraq Cancer Torment, The Independent, London, (March 4,1998).
16. R. Fisk : From the Cancer Ward of Basra Hospital, The Independent, London, (March 6,1998).
17. R. Fisk : The Evidence Is There. We Caused Cancer in the Gulf, The Independent, London, (October 16,1998).
18. Saleh M. & Meqwar A. The effects of using depleted uranium by the allied forces on man and the biosphere in selected regions of southern area of Iraq. A paper submitted to the International symposium on the use of depleted uranium and its effect on environment and health of man. Baghdad, 2－3 Dec.1998.
19. S. Peterson : A Special Report－The trail of a bullet－Will America risk use of DU in Kosovo?－DU's global spread spurs debate over effect on humans－A rare visit to Iraq's radioactive battlefield－DU's fallout in Iraq and Kuwait : a rise in illness? ; Christian Science Monitor, (April 29,1999).