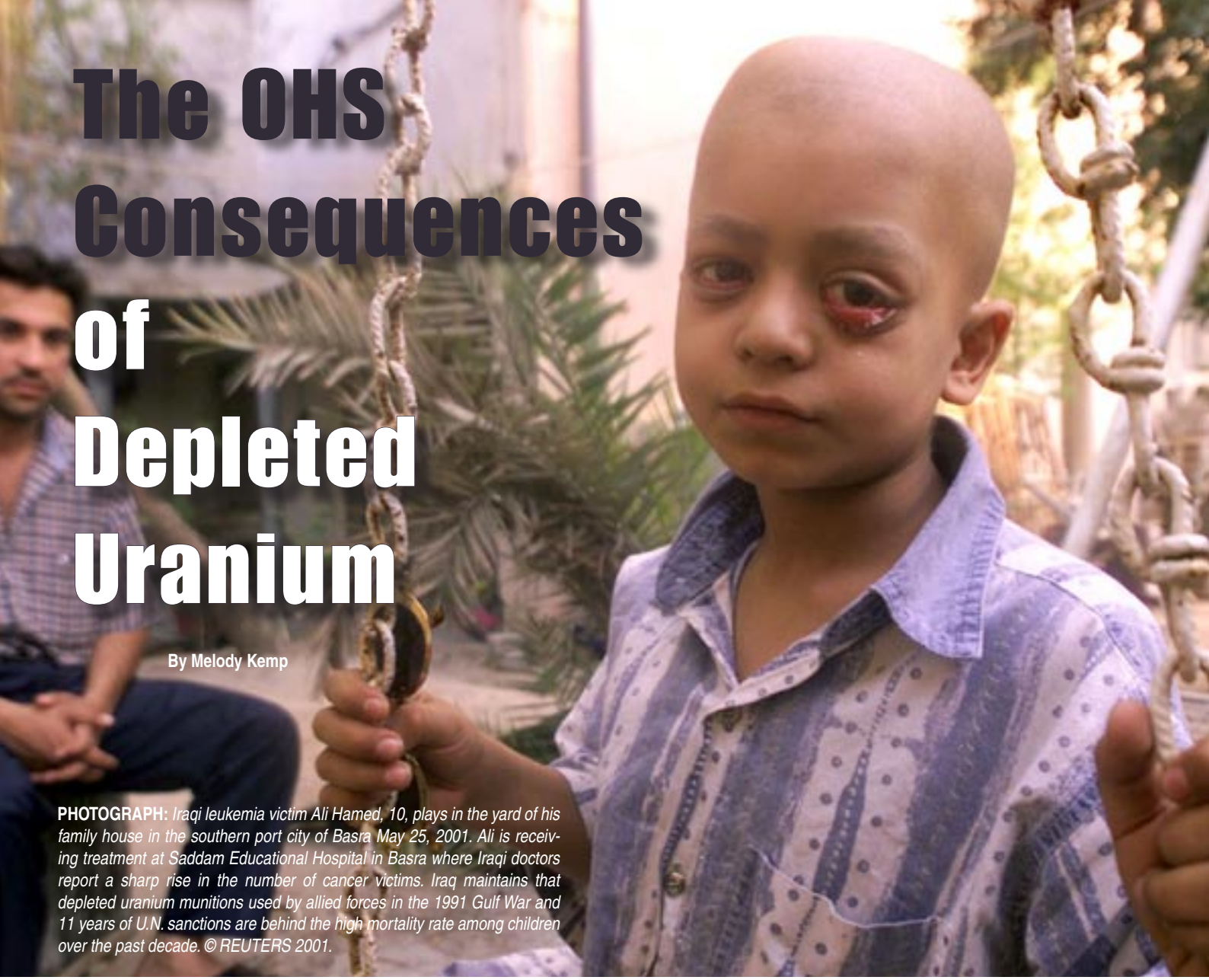
The OHS Consequences of Depleted Uranium

By Melody Kemp



PHOTOGRAPH: *Iraqi leukemia victim Ali Hamed, 10, plays in the yard of his family house in the southern port city of Basra May 25, 2001. Ali is receiving treatment at Saddam Educational Hospital in Basra where Iraqi doctors report a sharp rise in the number of cancer victims. Iraq maintains that depleted uranium munitions used by allied forces in the 1991 Gulf War and 11 years of U.N. sanctions are behind the high mortality rate among children over the past decade. © REUTERS 2001.*

"The troops could do nothing but evacuate the casualties and leave the gunner's body behind. When daylight came, the squadron leader, a padre and a number of the troops returned to the scene to bring the body out. Chemical warfare suits had to be worn because of the threat from the depleted uranium used in the American weapons. A remembrance service yesterday was interrupted by the thuds of incoming Iraqi artillery and the padre saying, "And the Lord said, oh, that was a bit close, get down." (The Guardian, March 31, 2003, A. Gillian)

The invasion of Iraq was notable in that saw we the serious escalation of 'weapons creep', that is the widespread deployment of weapons banned under the provisions of the Geneva Convention. These weapons include cluster bombs, fuel air weapons and the almost ubiquitous use of weaponised uranium: known benignly as depleted uranium (DU).

Banned by the Geneva Convention (refer to text box 1) they constitute weapons of indiscriminate effect, and pose an immediate and future threat to civilians. Some call them Weapons of Present and Future Destruction. A threat to the global commons, they invade and affect all areas of people's lives, including economic activity, so should represent an arena where OHS should share the stage with issues of environment, governance, activism and human rights.

The following is an outline of the issues specific to DU which will be renamed U238 for the sake of clarity. The author contends that the use of U238 weapons constitutes a grave risk for combatants, civilians, humanitarian workers and the denizens of the invaded nation. The broader use of these weapons during the 2003 invasion of Iraq has taken us all into the murky world of systematic and unaccounted for death and destruction. It remains to be seen if the men and women who countenanced the sale and use of these weapons will be brought to trial for crimes against humanity.

When he announced the departure of the Australian troops, the Prime Minister of Australia, John Howard, promised an Australian Broadcasting

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Corporation (ABC) journalist that he would not send troops to a theater where nuclear weapons were to be used. What he and the defence force chiefs knew was they were sending Australian Defence Force (ADF) into locations where the risk of contamination from radioactive heavy metal was a very real possibility, and where Australia itself was to use weaponised uranium warheads for anti tank fire.

After the First Gulf War (GWI), many reports detailing US military physicist, Dr Doug Rokke's concerns about the handling, use and cleanup of these weapons were sent to Australian senior defence bureaucrats (Pers. Comm. Dr. Rokke 2003). While John Howard and others may not define this war as nuclear, the effects of exposures to U238 will kill many more on both sides than actual combat. For Coalition troops U238 can be regarded as the Mother of Friendly Fires. So, does the sending of troops to Iraq in the knowledge that the UK and US partners **and** perhaps the ADF[1], would use DU weapons, constitute willful negligence?

Like Global Warming, which on a freezing day in a London flat, may sound vaguely attractive, so depleted uranium has a 'down homey' sound that belies its effects. While the US and UK military and their political masters reassure us that these weapons are indeed 'depleted' and thus harmless, the news from the front, is different. If it is harmless, why do recovery teams need to wear chemical warfare suits? If it is harmless, why have 10,000 US veterans died since returning from conflict zones where U238 was used (ibid)? If it is harmless, why are those who try to conduct research or conduct enquiries intimidated, sacked from their work, and why is their data stolen or destroyed (Pacifica radio interview with Dr Doug Rokke and Dr Patricia Axelrod, 2002). If U238 is harmless, why did the US and UK veto attempts by the conservative World Health Organisation (WHO) to conduct epidemiological studies of civilians post Gulf War One (Reuters November 30, 2001).

It is true that there is no definitive proof that DU causes birth defects, cancers and the broad sweep of symptoms attributed. We do have incomplete Iraqi epidemiology that has been dismissed as propaganda, but there is significant and growing circumstantial, geographical and temporal evidence to link the use of U238 with health and reproductive effects as well as micromolecular studies. The major issue is funds. The Uranium Medical Research Center (UMRC) is calling for funds to test Afghanis, but each test cost USD1000. The other issue is political will. So far attempts to study U238 have been met with frank interference and intimidation. Dr Rokkes phone and email are both tampered with and Dr Axelrod lives in fear for her life. Dr Asaf Durakovic once the highly respected Chief of Nuclear Medicine of the US Department of Veterans Affairs was also sacked when he began to draw uncomfortable conclusions linking U238 with patterns of illness (see Invisible War… the Politics of Radiation SBS TV 14 April).

Politically U238 is the Agent Orange of the new century. The US used defoliants during the American war in Vietnam, with horrible consequences for the civilians, combatants of all sides, and for the environment. Debate about the effects of such chemicals fell along partisan lines. The industrial estate in Dong Nai near Ho Chi Minh City is built on a sandy desert that was once verdant rainforest. Birth defects, skin and neurological conditions, and a variety of other chronic conditions were attributed to the use of chemicals, the most notorious of which was known colloquially as Agent Orange (mc Culloch 1984). The US, in the arrogant style we have come to know, denied any responsibility and Vietnam any war reparations.

The Royal Society of England published data showing that combat soldiers who inhale or swallow high levels of DU can suffer kidney failure within days.

Source: Depleted Uranium May Stop Kidneys In Days," Rob Edwards, New Scientist.com, 3-12-02.

What is U238?

The enrichment process for nuclear reactors involves separating U238 from the more radioactive U235. The remaining U238 is very dense (1.7 times as dense as lead) and highly pyrophoric metal that is ideal as a weapon to penetrate tank armour and bunkers. It is also plated onto tanks to prevent penetration by conventional weapons. On impact with a tank it burns. Remember the media coverage of the invasion of Iraq? The initial whump as the round hit a tank, then the explosion of flame as the round, and the contents of the tank, including its fuel, ammunition and occupants burned, at temperatures of around 5000C, carbonizing the occupants and reducing the U238 to a talc-like dust of uranium oxide. The US military cutely calls the Iraqi tank crews 'crispy critters'.

A single 120mm Abrams tank DU shell contains 5kg of U-238 (111 MBq of activity) and there is 275g (10.1MBq) in a 30mm GAU-8A A-10 Thunderbolt cannon shell. These 'penetrators' incinerate on impact, with up to 80% conversion to tiny long-lived glassy beads of Uranium Oxide measuring between 1 micron to 5 microns in diameter.

These 'hot particles' can travel for very large distances, up to 40kms, under the influence of wind, fire and are easily re-suspended. The smaller particles can easily pass through the lung into the blood and lymphatic system and across the placental barrier (Low Level Radiation Committee. (www.llrc.org).

According to the Uranium Medical Research Center's (UMRC) reports, these vitrified particles can stay in the lungs for up to 5 years, in contravention of the military's assertions that the uranium passes quickly through the body. Conventional environmental uranium is quickly excreted, but due to its vitrified nature, U238, (and its attendant pollutants like americium, neptunium and plutonium—(www.globalsecurity.org), cannot be easily biocleared. In January 2001, a Swiss lab detected traces of deadly plutonium 239 and radioactive uranium 236 in some of the DU shell residue sent from the Balkans. The very next day, a Pentagon spokesperson admitted that the US military had made the same discovery a year earlier, although nothing had been disclosed publicly.

In the body, U238 emits a degree of low level radiation for a depth of up to 5 cells. If the person has received a large dose of dust by, for instance, being in a sand storm such as that which occurred at the beginning of the recent invasion of Iraq, they may have inhaled many of these particles, all emitting alpha, beta and gamma radiation. Traditional (that is ICRP) ways of estimating this dose, would be to extrapolate the localized radiation to whole of body dose and dismiss it as inconsequential.

Particles in water and trapped in wounds or abrasions are also thought to be a source of cancer. They have been shown to pass the placental barrier to a developing foetus creating the horrifying birth defects seen in Iraq. *Anopthalmos*

1 At the time this went to press the author was still checking the weaponry used by the ADF with the Military Toxics Project in the USA. Of most concern is the Javelin anti-tank missile which is advertised as a kinetic weapon: code for DU.

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(being born without eyes) is extremely rare (normally one case in 50 million babies) and is known to have only two causes: exposure to radiation and a banned anti-helminthic drug. Of the eight cases of *anopthalmos* in post GW1 Basra, seven of the fathers were known to have had some contact with DU munitions (www.casi.org.uk/discuss/2001/msg01012.html). Girls in Iraq, as young as 8 years old are suffering cancer of the cervix which some have thought started *in utero* (*Axis of Whose Evil. Video*)

Occupational Health Issues

Recently, the European Committee of Radiation Risk (ECRR) released their report on Low Dosage Radiation (www.euradcom.org). The report reevaluated the existing linear models based on external dose, and noted that the models were inherited from post Cold War compromises between the International Atomic Energy Commission and the WHO and approved by industry and political powers (www.euradcom.org). They conclude that internal low dose radiation is in fact, 100 to 1,000 times more dangerous than was previously thought, in light of the patterns of illness seen in the aftermath of Chernobyl and GW1. Their studies of low dosage radiation and epidemiology of all nuclear power workers indicate that they have twice the rate of cancer as other workers. If one believes that the beginnings of war are at the weapons assembly plant, then weapons makers, power workers and all those involved in the nuclear chain are at increased risk. In the aftermath of Chernobyl, the way in which risk is measured, gave rise to huge discrepancies in official (28) and actual death tolls (more likely to be 500,000) because of reluctance to accept the chronic risk posed by low dose internal radiation (see interview with Professor Kirsten Schnaeder Frechette on Chernobyl ABC Breakfast April 25th).

If they are right, and the next few months will see successive reports issued, then occupational health and safety regulators and practitioners will have to overhaul their policies and guidelines.

Veterans Affairs and Monash University recently completed a major study of Australian Gulf War veterans which makes frustrating reading. (www.dva.gov.au/media/publicat/2003/gulfwarhs/index.htm). Despite the ECRR findings, the report takes an uncritical approach to the standard models of exposure, emphasizing the actual contact with U238 weaponry (which Australia did not use in GW1) of, in the main, navy personnel. They considered contamination via shrapnel but gave only cursory attention to other routes of entry. They conclude that according to urine uranium levels, that DU was not a significant contaminant, while it is known that vitrified particles would not be readily excreted. This in contrast to the UMRC's self-assessment report (www.umrc.net/selfassessment.asp) which tacitly implies that exposure is the most effective indicator. The Monash and other veterans studies study skims the issue of the Special Forces whose activities are a matter of extreme secrecy, and who are more likely to be on the ground directing fire and assessing the effects of attacks.

Gulf War Syndrome (GWS see box) is the most well known outcome of the operation of new wars. The British Ministry of Defence (MOD)

Dr. Asaf Durakovic, a professor of nuclear medicine at Georgetown University told a conference in Paris last year that tens of thousands of British and American soldiers are now dying from radiation they encountered during GW1 - supporting Dr Rokke and military nurse, Denise Nichol's data. He found that 62 percent of the symptomatic veterans tested had uranium isotopes in their organs, bones, brains and urine.

Source: Durokovic et al. The Qualitative Analysis of Depleted Uranium Isotopes in British, Canadian and US Gulf War Veterans. Military Medicine Vol. 167.8: 620. 2002.

Depleted-uranium arms: A health risk?

The U.S. used 315 tons of depleted uranium (DU) in weapons and armor during the Gulf War, exposing thousands of troops and civilians to potential harm.

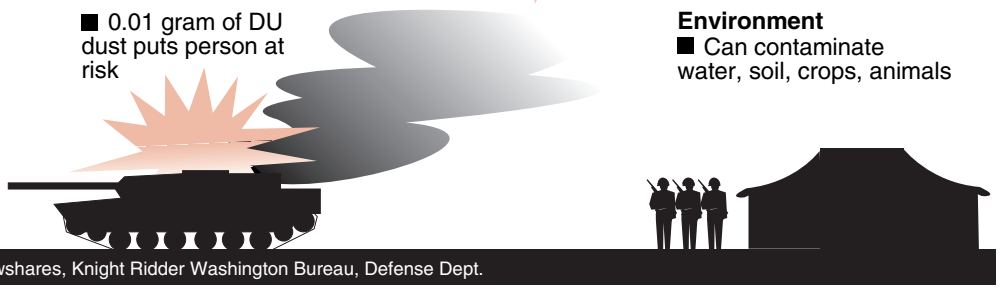
What is DU?
- Low-level radioactive metal; half-life of 4.5 billion years
- 1.6 times denser than lead so it makes artillery more deadly; armor more protective
- Ignites and burns on impact

Toxic dust
- Dust forms when DU burns
- DU 120mm artillery round hitting a tank can create 2 to 7 lbs. of dust
- 0.01 gram of DU dust puts person at risk

How DU travels
- Wind can blow dust for miles

Health effects
- Small particles can be inhaled or ingested
- DU can cause lung and bone cancers; kidney and liver problems

Environment
- Can contaminate water, soil, crops, animals



SOURCES: Swords to Plowshares, Knight Ridder Washington Bureau, Defense Dept.

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KRT/KEITH SIMMONS

With GULFSYNDROME, Knight Ridder by John Donnelly

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points at Post Traumatic Stress Disorder (PTSD) for GWS. However in face of the number of *civilians and combatants* from a wide variety of conflict zones showing the same symptoms and disorders, and coming from where oil wells are not a feature of the landscape (Afghanistan and Yugoslavia) or where vaccinations in the same combination are not required (Yugoslavia), the denials are becoming ever harder to sustain.

It is considered that male and female combatants are at most immediate risk from inhalation of particles, contamination of wounds and from accidental ingestion of particles on food or cigarettes. Dan Fahey from the Military Toxics Project noted that the 1998 battle map from the Pentagon showed that while the major GW1 use of U238 weapons happened in the southern desert regions, 460,000 troops marched through the 'hot zone' in their advance to the north, many taking souvenirs home from the mangled tanks ('Downwind' Video).

Symptoms include respiratory distress, skin rashes and blisters, weakness, kidney related symptoms, reproductive effects, and cancers. Tissues sensitive to radiation are most likely to be effected, thus an increase of 143% in thyroid cancer in Al Basra.

If water and food comprises a risk, then the logistics of war need urgent revision. What do humanitarian workers eat or drink when they come to repair the mess made by war? What degree of risk are they at from re-suspended uranium oxide particles during field work or construction? Should radiation testing become a standard assessment criterion for all post-conflict water supply and agricultural reconstruction projects? Is it fair to expect humanitarian workers to enter areas known to be contaminated? What are the management, ethical and legal issues of sending them into possibly toxic environments? What risk do journalists take in covering these new wars? Was the real purpose of issuing them with special suits to prevent U238 intoxication?

In addition, indigenous workers coming back to reclaim damaged workplaces, farmers in sandy regions trying to replant after battle, livestock herders, scavengers (there is already evidence that Bedouins scavenging tank parts from GW1 have increased rates of cancer and birth defects), transport workers, street traders not to mention women and children whose lives are hostage to the environment. After this invasion most urban buildings would have some degree of U238 contamination in light of the ubiquity of these weapons.

Environmental effects

A fact sheet on depleted uranium (U238) prepared by the WHO warns that food and drinking water can become contaminated where U238 weapons have been used, and recommends careful monitoring of any area where there is a "reasonable possibility" that U238 could enter the ground water or the food chain. The UN Environment Programme (UNEP) has been tracking the use of U238 in the Balkans and found it leaching into the water table. Seven years after the conflict it has recommended the decontamination of buildings where U238 dust is present to protect the civilian population against cancer. The Environment Committee of the Council of Europe found that during the Kosovo war, NATO countries violated provisions of the Geneva Conventions intended to limit environmental damage. Among other things, the committee cited "the use of depleted uranium in warheads" as a violation that had "dramatically worsened" Yugoslavia's environment "with long-lasting effects on the health and quality of life for future generations." The committee further found that this damage "can be presumed to have been deliberate." In their case against NATO for crimes against humanity, Serbs testify that the death of livestock and defects in their offspring were also on the increase. Expert analysis of two samples of tea plants picked on Mt. Romania revealed beta particles of 1,130 Bq/kg and 1,118 Bq/kg, considerably higher than the accepted dosage of 600 Bq/kg.(www.isu.bg.ac.yu/apel/du-documents.html)

During GW1, the area around Al Basra was heavily bombarded with U238 ordnance, particularly the major highway from Kuwait. Over 6,000 *retreating* Iraqi's were obliterated and their irradiated tanks still litter the infamous 'Highway of Death'. That area, being adjacent to the southern delta, was Iraq's major food producing region. Now there are reports of livestock being affected and most of the food gardens on the outskirts and in Al Basra, produce inedible irradiated food (**Source:** Professors Al Azzawi, and Marouf in Selected Research Works on the Effects of DU and Man and Environment in Iraq, results of the Conference in Baghdad. November 2001. pp 69-93).

Between 1984 and 1994, the Army shot 80 metric tons rounds of U238 into a 2,000-acre (800 ha) target zone at the Jefferson Proving Ground (JPG) in Indiana. Although some of the uranium was picked up and recycled, more than 60,000 kg remains embedded in the soil (www.globalsecurity.org/military/facility/jefferson.htm).The area was one of significant biodiversity, so the DOD tried to give it back to the National Parks Service after weapons testing was terminated. But to clean the U238-contaminated areas of the JPG range, the Army would have to strip away about half a metre of soil to ensure the simultaneous removal of U238 and Unexploded Ordnance (UXO), potentially facilitating soil erosion and increasing the potential for U238-contaminated soil to migrate to previously clean areas. At an estimated cost of some USD 1.7 billion, this was considered too expensive. It is now known as an Area of National Sacrifice. Considering that some 2,000 metric tons were recently used in Iraq, can the whole nation to be regarded as 'Region of National Sacrifice'?

As the US showered Yugoslavia with U238 weapons, it ran a campaign at home to promote its Green Credentials. The US Army's credo "Sustaining the Land We Defend" shows a striding soldier with M-16 at the ready, with a voice over claiming that soldiers were trained to follow environmental guidelines and protect natural resources. Despite that, in early April 2003, the US declared it would not clean up Iraq as they considered there was still no risk. (http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/2946715.stm). More recently still (25 April, 2003), the British government declared it does have a moral responsibility to clean up Iraq. However, without the economic backing of

In a leaked US study, 5 out of 22 veterans with DU schrapnel wounds were found to have uranium isotopes in their semen which may account fort the birth defects seen in Gulf War veterans and conflict zone civilians.

Source: "Catastrophe: Ill Gulf Vets Contaminated Partners With DU," The Halifax Herald Limited, Clare Mellor, 2-09-01.

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the US it is highly unlikely that Britain and Australia could manage this gargantuan task, and the threat of litigation is a Damocletian disincentive for them to admit liability.

As Counterpunch notes, not only is the military globally the biggest polluter, but the Army is exempt from reporting and is under no legal requirement to clean up its mess. (www.counterpunch.org/waco2.htm) Clearly, "Sustaining the Land We Offend" is not a matching credo. Under regulations published by the US Department of the Environment, U238 meets the criteria of transuranic waste, and thus should be buried in geologically stable repositories. If the US Army refuses to clean up its waste in the US, it is highly unlikely to do so in the lands it now occupies (Schwartz 1998, p 372).

A UK Atomic Energy Authority report said that some 500,000 people would die before the end of this century, due to radioactive debris left in the desert. If that is true, and the epidemiological trend in Iraq seems to support this case, then the Coalition including Australia that used the U238 armed Javelin missile and other possibly U238 ordnance could and should be charged with crimes against humanity.

Mechanisms of Ill Health.

The major argument so far has been in relation to the degree of radiation. There is no doubt that U238 is not highly radioactive—but that may also depend on the degree of contamination from other isotopes and metals, such as plutonium. However, it is a toxic metal, and so some scientists consider that the illness patterns, including cancers, could be a result of complex interactive effects. The idea that chemical and radiological damage are reinforcing each other is very plausible and gaining momentum, says Carmel Mothersill, head of the Radiation and Environmental Science Centre at the Dublin Institute of Technology in Ireland. "The regulators don't know how to handle it. So they sweep it under the carpet." We know that uranium disturbs genes, chemically altering the DNA, and activating genes that are usually more dormant. The fear is that the resulting abnormally high activity in cells could be a precursor to tumour growth. Those findings are congruent with the findings of the ECRR.

Alexandra Miller, a radiobiologist with the Armed Forces Radiobiology Research Institute in Bethesda, Maryland, has discovered the first direct evidence that radiation from U238 damages chromosomes within cultured cells. Her findings indicate that chromosomes break and reform in a way that results in abnormal joins (Military Medicine, 2003, vol. 167, p 120) commonly found in tumour cells. Researchers at the Bremen Institute for Prevention Research, Social Medicine and Epidemiology in Germany have found that of the blood samples taken from soldiers, those with broken strands of DNA that had been incorrectly repaired occurred at five times the rate as in a control group of 40 healthy volunteers (Radiation Protection Dosimetry, 2002, vol. 103, p 211).

Miller has recently found that radiation increases gene activity in cultured cells at doses of U238 not known to cause chemical toxicity. The possible consequences are made all the more uncertain because no one knows if genes switched on by U238 radiation enhance the damage caused by genes switched on by U238's toxic effects, or vice versa.

(**Source:** www.newscientist.com/news/news.jsp?id=ns99993627)

It is worth remembering that the army of 100,000-plus young men and women who will occupy Iraq for who knows how long—and of course the Iraqis who have nowhere else to go —will all be putting their health on the line, so that we can create a certain degree of greater target penetration with our weaponry (Tom Dispatch 7 April 2003).

Suspected Contributors to Gulf War Syndrome

1. **Depleted uranium**, incorporated into tank armor, missile and aircraft counterweights and navigational devices, and in tank, anti-aircraft and anti-personnel artillery.
2. **Vaccines** intended as protection against nerve and biological warfare agents.

- **Pyridostigmine**, normally prescribed for myasthenia gravis and known to have serious side effects, especially when the person taking it is exposed to heat. It is also known that exposure to pesticides and insecticides (Baygon, Diazinon and Sevin) should be avoided when taking pyridostigmine because they can accentuate its toxicity. Some women, who took this drug during pregnancy and have breast-fed infants, have seen side effects in their child.
  - **Botulinum Pentavalent**, an unproven vaccine intended to counteract botulism. It is unlicensed in the United States.
  - **Anthrax.** This was apparently selectively administered to troops during the war, and women receiving it were warned not to have children for three or four years.

3. **Smoke and chemical pollutants** released by the continuous oil-well fires—levels of soot, carbon monoxide and ozone. The National Toxics Campaign, Boston, Massachusetts, found five different toxic hydrocarbon products in the smoke (1,4-dichlorobenzine, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate and naphthalene), any one of which could induce serious health effects.

4. **Old World leishmaniasis**, a parasitic disease transmitted by the bite of many species of sand fly indigenous to the region. If left undiagnosed, and therefore untreated, it can be fatal. Diagnosis requires bone and spleen biopsy, and the disease can have a three-year incubation period without causing symptoms. It can be transmitted by blood transfusion, and transmitted by a woman to her unborn child. Leishmaniasis was reported as widespread in Iraq and Saudi Arabia.
5. **Pesticides and insecticides** were used extensively throughout the war to protect against pestilence. It is known that large quantities of DDT, malathion, fenitrorthion, propuxur, deltamethrin and permethrin were used. They are all toxic nerve agents, and many are suspected carcinogens and mutagens.
6. Destruction by allies of Iraqi **chemical, nerve and biological warfare** weapons resulting in widespread distribution of these toxins in the environment.
7. The **electromagnetic** environment which permeated the battlefield during the war. Veterans were exposed to a broad spectrum of electromagnetic radiation created by electricity generated to support the high-tech instruments, thousands of radios and radar devices in use. This intense electromagnetic field causes both thermal and non-thermal effects, and potentially interacts with the other hazardous exposures and stresses of the battlefield. Electromagnetic radiation can alter the production of hormones (neurotransmitters), interact with cell membranes, increase calcium ion flow, stimulate protein kinase in lymphocytes, suppress the immune system, affect melatonin production required to control the "body clock," and cause changes in the blood-brain barrier. (**Source:** Edited from Dr R. Bertells www.ccnr.org/bertells_book.html)

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What Needs to be Done?

When one examines the logistics of 'safe warfare' using U238 they begin to look impossible. U238 weapons represent an unholy marriage of the nuclear industry and the military industrial complex. In a sense it solves one problem (mounting piles of nuclear waste) by relocating it elsewhere and by doing so, makes one of modern warfare's most effective weapons. So it is easy to realize why the Pentagon and others do not want to give them up. Flirtations with Tungsten warheads indicate that they are expensive and not as effective, particularly at bunker busting.

But when one weighs the longer term exigencies against short term gains, one must conclude that the weapons need to be banned. But what is to be done with all those existing and potential victims?

- Alternative forms of accurate bioassays needs to be developed and standardized. The UMRC's self assessment needs to be circulated to and completed by all those working in conflict zones as the precursor for detailed studies.
- Environmental sampling has to be conducted in all conflict zones.
- Epidemiological studies of combatants and civilians need to be conducted by independent authorities.
- Contaminated areas need to be cleaned up using funds from belligerent nations.
- All nations using and selling weaponised uranium should publicly disclose those weapons.
- Studies need to be undertaken to assess the behaviour, dispersal and re-suspension patterns of uranium oxide I order to effect decontamination ad assess health risk.
- Veterans and civilians should be adequately compensated for death, illness, and economic loss.
- Governments have to disclose to the tax payers who fund the purchase of armaments, if they are using radioactive weapons and citizens should be allowed to say if these weapons are to be used in their name.

TEXT BOX 1

The use of the above ammunition is not only inhumane but also contrary to the international law. A number of international conventions prohibit the manufacturing and use of such weapons as well as such handling of nuclear substances (Convention on Physical Protection of Nuclear Materials of 1970; The Treaty on the Prohibition of Nuclear Weapons Tests of 1963, etc).

- According to Article 55 of the Additional Protocol to the Geneva Convention (Protocol I), it is prohibited to use the methods and means of warfare whose aims is or may be expected to cause such degradation of environment thereby damaging health or survival of the population. A Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I of 1977) – provides other important foundations for the Request:
- Article 35, Paragraph 2 – prohibits employment of "weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering";
- Article 35, Paragraph 3 – prohibits employment of "methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment";

Summary

U238 has a half life is 4.5 billion years, as long as the earth has been in existence. This itself is daunting when one considers the reality of contamination. We, as a race of civilised beings, need to consider if this is acceptable for us and to future generations. In the meantime, we should consider the adequacy of existing regulatory and treatment guidelines and make sure that those who fight in our name, and those innocents who suffer in our name, are not burdened in decades to come.

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There are numerous web sites with valuable information. Good starting points are
www.traprockpeace.org
www.Umrc.net.
http://www.betterworldlinks.org/book60h.htm
www.llrc.org

About the Author

Melody Kemp has been active in OHS fields for many years and has lived for almost 12 years, on and off, in Indonesia. In 1989 she completed her thesis on The Human Ecology of Logging in Solomon Islands. Since then she has completed several post-graduate studies and has been a Research Fellow at the Edith Cowan University and the University of Western Australia. Since June 2000 she has been a researcher with the United Nations Institute for Research into Social Development (Geneva). Other than many conference papers, Melody wrote: *Working for Life: A Handbook for Women Industrial Workers.* This book was published in early 2000, by Isis International. It is designed as a how-to-do-it guide to occupational health and safety for women industrial workers and trade union or labour organisers in the developing world. It took some five years of work and research.