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# Toxic munitions cause of baby deaths and deformities in Fallujah

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In September this year, say campaigners, 170 children were born at Fallujah General Hospital, 24 per cent of whom died within seven days. Three-quarters of these exhibited deformities, including "children born with two heads, no heads, a single eye in their foreheads, or missing limbs". The comparable data for August 2002 — before the invasion — records 530 births, of whom six died and only one of whom was deformed.

The data — contained in a letter sent by a group of British and Iraqi doctors and campaigners to the United Nations last month — presaged claims made in a report in The Guardian yesterday that there has been a sharp rise in birth defects in the city. The paper quoted Fallujah General's director and senior specialist, Dr Ayman Qais, as saying: "We are seeing a very significant increase in central nervous system anomalies... There is also a very marked increase in the number of cases of brain tumours." Earlier this year Sky News reported a Fallujah grave-digger saying that, of the four or five new-born babies he buries every day, most have deformities. [right: Iraqi boys play with remains of US rocket.]

The campaigners' letter to the UN calls for an independent investigation to be set up, "the cleaning up of toxic materials used by the occupying forces, including depleted uranium and white phosphorus", and an inquiry launched to discover if any war crimes have been committed.

The campaigners believe that either white phosphorus or depleted uranium is a major, if not only, cause of the birth defects. White phosphorus, which US military has admitted firing on insurgents in heavily populated Fallujah, has a long history of military use, dating back to the First World War.

And although no scientific study has ever proved a causal link between depleted uranium and serious medical problems Ð and several studies seem to have proved the opposite — it is by no means in the clear. Ever since the first Gulf War, its use has been linked to cancers among returning troops.

**WHAT IS DEPLETED URANIUM?**

Depleted Uranium, or DU, is a waste material left over from the nuclear industry. A vast amount of this waste DU is produced when natural uranium is enriched for use in nuclear reactors and nuclear weapons. Only the uranium isotope U-235 can be used in nuclear processes, such as reactors and weapons. As most of this isotope is removed from naturally occurring uranium, the remaining uranium product comprises U-238 and smaller amounts of

the more highly radioactive U-235 and U-234. DU is both chemically toxic and radioactive. It is this latter product, the left over uranium, comprising mainly U-238, which has been used to make ‘depleted’ uranium weapons. It is used for weapons because this heavy, dense metal is judged by the army to be an excellent penetrator of enemy armour, tanks, and even buildings.

A large amount of DU in the stockpiles held in the United States has been contaminated with recycled spent nuclear fuel from nuclear reactors. For example trace amounts of U-236 and highly radioactive substances such as plutonium, neptunium and technetium were found in a DU anti-tank shell used in Kosovo. Hundreds of thousands of tons of this contaminated stock was exported to the UK, France and other countries in the 1990s. The extent to which this DU has been contaminated with recycled spent fuel is still unknown and undisclosed.

Governments have largely ignored the serious dangers this recycled fuel represents. A common defence used by the British and US governments and their militaries is to claim that depleted uranium is less radioactive than natural uranium and therefore does not constitute a risk to human health. This statement is, however, misleading. In its natural form uranium is present in our environment in very small quantities as an ore, for example in rocks and soil. Conversely, the DU used by the military has been concentrated relative to background amounts, and is therefore many times more radioactive than uranium ore.

In May 2003 Scott Peterson, a writer with the US newspaper CSM, examined radioactivity levels next to DU bullets in Baghdad and found Geiger-counter readings were 1900 times greater than background radiation levels next to DU bullets. When natural uranium is concentrated in a similar form to ‘depleted’ uranium it emits about 40% more alpha radiation, 15% more gamma radiation and around the same level of beta radiation. The chemical toxicity of uranium does not depend on the isotope, therefore enriched, ‘normal’, and depleted uranium are equally toxic chemically.

It is extremely difficult and expensive for the nuclear industry to store DU. It is thought that the US currently has 1 billion tonnes of depleted uranium radioactive waste, while the UK has at least 50,000 tonnes. This waste is stored in cylinders at many sites across the US and UK and is vulnerable to corrosion and leaks owing to ageing cylinders and outside storage. It is stored mainly in the form of depleted uranium hexafluoride (DUF6) which can leak if the corroding cylinders are breached. At least 10 cylinders are known to have breached during the past 10 years.

Turning this DU waste into weapons solves some of the problem faced by the Government and nuclear industry, concerning what to do with these large stockpiles. Not only is DU practically free of charge for the arms manufacturers, but it no longer has to be stored and monitored indefinitely.

## THE HEALTH EFFECTS OF DEPLETED URANIUM

Depleted uranium is a risk to health both as a toxic heavy metal and as a radioactive substance. The UK and US Governments have long sought to play down these risks. While, as late as 2003, the UK Government was claiming that DU presented no harm to soldiers or civilians, yet accumulating and alarming evidence from scientists, soldiers and activists has forced them to back down and recognise the risks posed.(1) However what is clear from reading all major studies is that more research urgently needs to be done. There exists very little research on the effects of uranium contamination in humans and accurate tests to

understand exposure doses from military uses of DU have never been done.

There are three main routes through which DU exposure on the battlefield takes place: inhalation, ingestion and wounding.(2) As a DU penetrator hits its target some of the DU from the weapon reacts with the air in the ensuing fire and becomes a fine dust (often called an 'aerosol') that makes inhalation and ingestion a possibility for those in the area. Even after the dust has settled, the danger remains that it may be resuspended in the future by further activity or the wind, and again pose a threat to civilians and others for many years into the future. DU particles have been reported as travelling twenty-five miles on air currents.(3) Open wounds also allow a gateway for DU into the body and some veterans have also been left with DU fragments in their bodies, remaining after combat.

Inhaled DU dust will settle in the nose, mouth, lung, airways and guts. As a DU penetrator hits its target, the high temperatures caused by the impact ensure the DU dust particles become ceramic and therefore water insoluble. This means that, unlike other more soluble forms of uranium, DU will stay in the body for much longer periods of time. This aspect of uranium toxicology has often been ignored in studies of the health effects of DU, which base their excretion rates on soluble uranium. DU dust can remain in the sticky tissues of the lung and other organs such as the kidneys for many years. It is also deposited in the bones where it can remain for up to 25 years.(4) This helps explain why studies of Gulf War veterans have found that soldiers are still excreting DU in their urine over 12 years after the 1991 conflict (5) . Ingested DU can be incorporated into bone and from there will irradiate the bone marrow, increasing the risk of leukaemia and an impaired immune system. (6)

External exposure to DU entails exposure to alpha, beta and gamma radiation. Although the skin will block alpha particles, beta and gamma radiation can penetrate beyond the dead outer skin layers and damage living tissue. Beta particles can penetrate to a depth of 2 cm, while gamma radiation (through a process called 'the Compton effect') generates beta particle radiation along its trajectory through the body. Neither is all external exposure to alpha radiation harmless. Cataracts, for example, can be caused by exposure to alpha radiation.(7)

Inside the body, DU poses a health risk in a variety of ways to different organs. The kidneys are the first organ to be dfamaged by DU. At a high dose kidney uranium levels can lead to kidney failure within a few days of exposure.8 Lower doses lead to kidney dysfunction, and can lead to an increased risk of kidney disease later in life.

As a radioactive emitter, DU also presents a risk to the lungs. Traditionally, radiation dosimetry measures the extent of harm by calculating the external radiation absorbed by the tissues; the so-called 'absorbed' dose.(9)However because DU dust is inhaled or ingested, it can remain in the body tissues and emit intensive radiation over a longer period. This way it can cause a large amount of damage over a relatively small area, changing a person's genetic codes and causing cancers. For these reasons soldiers and civilians exposed to DU risk developing lung cancers, particularly if they are smokers because their lungs will already have been irritated.

There is much new evidence emerging about the risks from so-called 'low level' radiation and the damage it can do to DNA. Considerable evidence has been accumulated recently about the 'by-stander' effect, which shows that irradiated cells pass on damage to surrounding healthy cells. In this way it is thought low-level radiation can cause much

greater damage than would otherwise be expected.(10) Studies have also shown that irradiated cells pass on chromosomal aberrations to their progeny so that non-irradiated cells several generations, or cell divisions later, will exhibit this radiation-induced genomic instability (RIGI).(11)

New evidence is also suggesting that the chemical toxicity of DU and its radioactivity reinforce each other in a so-called 'synergistic effect', which means it 'punches above its own weight' in terms of the damage it can do to cells. Alexandra Miller of the US Armed Forces Radiobiology Research Institute in the USA found in a study in 2003 that when human bone cells are exposed to DU, fragments break away from the chromosomes and form tiny rings of genetic material. This damage was seen in new cells more than a month after removal of the DU, leading to an eight-fold increase in genetic damage relative to that expected.

It's not just in terms of increased risk of cancer that DU DNA damage can affect health. It is also implicated in causing a depressed immune system, reproductive problems, and birth defects. For example, a study of US Gulf War veterans has found that they are up to three times as likely to have children with birth deformities than fathers who had not served; and that pregnancies result in significantly higher rates of miscarriage.(12) A major 2004 Ministry of Defence-funded survey study from the London School of Hygiene and Tropical Medicine has found that babies whose fathers served in the first Gulf War are 50 per cent more likely to have physical abnormalities. They also found a 40 per cent increased risk of miscarriage among women whose partners served in the Gulf.

In Basra, in southern Iraq, there have been striking reports for a number of years about the rise in local childhood cancers and birth deformities seen there. The findings of a leading Iraqi epidemiologist, Dr Alim Yacoub,13 were presented in New York in June 2003 and suggest there has been a more than five fold increase in congenital malformations and a quadrupling of the incidence rates of malignant diseases in Basra.(14)

The Dutch Journal of Medical Science reported the findings of the Flemish eye doctor, Edward De Sutter. He found 20 cases out of 4000 births in Iraq of babies with the phenomenon anophthalmos: babies who have been born with only one eye or who are missing both eyes. The very rare condition usually only affects 1 out of 50 million births.

The damaging effects to health that DU weapons present are of particular concern because of the likelihood of civilians becoming exposed after conflicts have ended. Children especially are at risk because of playing in and ingesting contaminated soil and most of the health risks discussed are of particular danger to younger children.

**ENVIRONMENTAL CONTAMINATION FROM DU**

The release of DU into the environment can pollute land and water for decades to come. Its danger is not limited to battlefield releases but will expose present and future generations of civilians to contaminated food and water supplies. Environmental releases of this sort can also be expected to have negative effects on plant and animal life although little is known about this.

DU dust in the environment can become resuspended through weather conditions and human activity, such as farming. Of particular worry is that children are especially vulnerable to receiving significant exposures through playing on sites and ingestion of

contaminated soil by way of typical hand-to-mouth activity.

DU can also contaminate soil through corrosion from the original penetrator. It is believed that 70-80% of all DU penetrators used in the Gulf and the Balkans remain buried in the soil. A United Nations Environment Programme study in Spring 2002 found that recovered penetrators had decreased in mass by 10-15%. Corrosion can feed uranium into groundwater, where it can travel into local water supplies. DU in soil can also enter the food chain since it is taken up by plants grown in it and by animals used for food. A UNEP post-conflict report on Bosnia and Herzegovina has indeed found that DU had also leached into local groundwater. The same study found that radioactive hotspots persisted at some of the sites studied. Klaus Toepfer, the Executive Director of UNEP, said at the time, "Seven years after the conflict, DU still remains an environmental concern and, therefore, it is vital that we have the scientific facts, based upon which we can give clear recommendations on how to minimise any risk".

The British and US militaries have demonstrated extreme irresponsibility in releasing DU into the environment, using it without proper monitoring or information about the risks it poses even in their own countries. In January 2003, the US Navy admitted routinely firing DU from its Phalanx guns in prime fishing waters off the coast of Washington state since 1977. At the Dundrennan testsite in Scotland around 30 tonnes of DU rounds have been fired into the Solway Firth. Only one has ever been retrieved, when it was found in a fisherman's net.

Both governments have been equally callous in their disregard concerning the long term risk to civilians in countries where they have used DU.

**DU AND THE MILITARY**

DU is used in a variety of military applications. It is attractive to the military, governments and the nuclear industry for three main reasons. Firstly, as mentioned earlier, it is in cheap and plentiful supply and solves the problem of storage and monitoring. Secondly, it is a very effective battlefield weapon because its high density and self-sharpening qualities enable it to penetrate hard targets with ease. Thirdly, DU is pyrophoric, which means it burns on impact, enhancing its ability to destroy enemy targets. The UK test firing of DU began at the Eskmeals range in Cumbria in the early 1960s. Testing continues today at Dundrennan, in Southern Scotland, most recently before the 2003 attack on Iraq. DU is now used in two types of ammunition in the British armed forces: the 120 mm anti-tank rounds (CHARM 3), which is fired by the Army's Challenger tanks and 20mm rounds used by the Royal Navy's Phalanx Close-In Weapon System (a missile defence system). The Phalanx system was developed by the US Navy and is used by both the Australian and British Navies. In 1993, a leaked Pentagon report revealed how the use of DU could lead to increased cancer risks: this leak caused the US manufacturers to switch to tungsten alternatives. Because of this the Royal Navy has been forced to convert its replacement ammunition to tungsten too, although it still has stockpiles of DU.

The US military uses DU mainly for its Abrahams tanks and A10 warplanes, although it is also used in its Bradley fighting vehicles, AV-8B Harrier aircraft, Super Cobra helicopter and its Navy Phalanx system. It is also used by the US military for a variety of other applications including bombshells, tank armour plating, aircraft ballast and anti-personnel mines. Although the US and UK militaries are the only countries who have been properly documented as using DU weapons, they are known to be held by at least seventeen other countries including: Australia, Bahrain, France, Greece, Israel, Jordan, Kuwait, Pakistan,

Russia, Saudi Arabia, South Korea, Taiwan, Thailand, Turkey, and the United Arab Emirates.

The testing of DU weapons has caused considerable contamination at test sites across the world. At Dundrennan, in Scotland, for example, a 2004 Ministry of Defence report revealed how, since 1982 over 90 shells had either been misfired or had malfunctioned and scattered fragments of DU across the ground. Despite searches, some of these fragments have never been recovered. Contamination levels were high in these areas, which have had to be fenced off. At Okinawa in Japan, and Vieques, an island of Puerto Rico, the US military used DU weapons without the appropriate licences and without informing their respective governments or local populations. In the US, the Army is attempting to walk away from its responsibilities to decontaminate former test sites, such as Picatinny Arsenal in New Jersey and Jefferson Proving Ground in Indiana.

It is now clear that the military have known the risks of depleted uranium but failed to provide safety instructions to soldiers in both the 1991 Gulf Wars and the Balkan conflicts. A study prepared for the US Army in July 1990, a month before Iraq invaded Kuwait, says: "The health risks associated with internal & external DU exposure during combat conditions are certainly far less than other combat-related risks. Following combat, however, the condition of the battlefield and the long-term health risks to natives & combat veterans may become issues in the acceptability of the continued use of DU."

Furthermore, a leaked 1993 document from the US Army Surgeon General's office said, "When soldiers inhale or ingest DU dust they incur a potential increase in cancer risk … that increase can be quantified in terms of projected days of life loss."

**DU IN IRAQ**

The 1991 Gulf War saw the first verified use of DU weapons. Around 320 tonnes of DU in weapons were used in the war, of which about 1 tonne was used by the UK military. According to data from the US Department of Defense, tens or hundreds of thousands of US military personnel could have been exposed to DU. Both the US and UK Governments refused any responsibility for decontamination and both refused to study the exposure rates or after-effects of this DU use. After a few years, evidence began to emerge from Iraq about the increasing incidence of cancer and birth deformities in the south of the country. After heavy US lobbying in November 2001 the UN General Assembly voted down an Iraqi proposal that the UN study the effects of the DU used there.

In the 2003 attack on Iraq, the US and UK militaries used DU again despite the lack of reliable data on the effects of using it in Iraq 12 years previously. The British Government has admitted using 1.9 tonnes of DU. Even though this is only a tiny proportion of all DU used in Iraq, it is double the amount used in 1991. The US authorities have still not said how much has been used, although an initial Pentagon source revealed 75 tons of DU may remain in Iraq from A-10 planes alone.

The implications for Iraqi civilians are very alarming. Unlike the first Gulf War, which was largely confined to desert areas, much of the DU use has been in built-up, heavily populated areas. The US Government has refused any cleanup of DU in Iraq, clinging to the statement that it has no link with ill health, while the British Government has for the first time admitted it does have a responsibility but says it is low on their list of priorities.

**OTHER COUNTRIES CONTAMINATED BY DU**

**BOSNIA 1994-1995**

DU rounds were used in Bosnia by US A-20 warplanes under the auspices of the North Atlantic Treaty Organisation (NATO). Around 10,800 DU rounds, or 3 tonnes, were used in Bosnia. However NATO always denied DU had been used until 2000, 6 years after the attacks, when media reports began to emerge. For all this time no cleanups or public awareness campaigns could be run, leading to unnecessary civilian exposures. The UNEP report,1 mentioned earlier, and released in March 2003, found DU contamination of drinking water and radioactive 'hotspots'. UNEP recommended ongoing monitoring of drinking water, cleanup of DU sites, cleaning of contaminated buildings and the release by NATO of all DU-attack coordinates.

**KOSOVO, YUGOSLAVIA – 1999**

US A-10 aircraft fired around 31,300 rounds of DU, or 9 tons of DU in areas of Kosovo, Serbia and Montenegro during NATO action there in 1999. Partial information about the use of DU was released a year after the war when UN Secretary General KofiAnnan sent a letter requesting the information to NATO Secretary General Lord George Robertson. An analysis in a UNEP Post-Conflict field study of recovered DU shells, published in March 2001, found that some of the shells were made with recycled uranium (that is, with uranium that had been through a nuclear reactor) and were contaminated with plutonium. The study did not find widespread contamination but did find evidence of airborne movement of DU dust. It also found localised points of concentrated contamination showing U-238 at 10,000 times normal background levels. The study recommended decontamination, removal of penetrators and drinking water monitoring. A separate report published by UNEP on DU contamination in Serbia and Montenegro found "widespread, but low-level DU contamination, airborne DU particles" and that "DU dust was widely dispersed into the environment."

As well as official reports there has been widespread anecdotal evidence of so-called 'Balkans syndrome' among both soldiers deployed in the region and civilian populations. Symptoms are similar sounding to "Gulf War Syndrome" with heightened levels of leukaemia, respiratory and immune system illnesses. By mid-2004 twenty-seven Italian soldiers have died of symptoms thought to be linked to DU exposure. A court in Rome ordered the Italian Ministry of Defence to compensate the family of Stefano Melone, a soldier who died of a malignant vascular tumour. According to the court, Mr Melone's death was "due to exposure to radioactive and carcinogen substances" on missions in the Balkans.

Tension was caused within NATO as member countries were not warned that their soldiers would be entering DU contaminated zones.

**AFGHANISTAN 2001- 2004**

There is some evidence that DU has been used in Afghanistan, although this has never been confirmed officially. For example, US A-10s and Harrier aircraft, which both use DU ammunition, are known to have been active in the region. Defense Secretary Donald Rumsfeld has said that the US has found radioactivity indicating DU use by the Taliban or Al-Qaeda.

**Geneva Convention Rules** (to which US and UK are signees)

– The limitation of unnecessary human suffering [Art.35.2]
– The limitation of damage to the environment [Art. 35.3 and 55.1]
– It is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering [Art. 35.3]
– It is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment. [Art. 35.2]
– In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives. [Art. 48]
– Indiscriminate attacks are prohibited. Indiscriminate attacks are:
(a) those which are not directed at a specific military objective;
(b) those which employ a method or means of combat which cannot be directed at a specific military objective; or
(c) those which employ a method or means of combat the effects of which cannot be limited as required by this Protocol; and consequently, in each such case, are of a nature to strike military objectives and civilians or civilian objects without distinction. [Art.51.4]
– Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population. [Art. 55.1]



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