Depleted Uranium

Why depleted uranium should be banned from New Zealand

Physicians and Scientists for Global Responsibility

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committed citizens can change the world.
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Margaret Mead.

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1. Depleted uranium

Weapons and tank armour using depleted uranium (DU) have developed in part because of the unique qualities of DU and partly out of a need to dispose of extensive stockpiles of the waste product of uranium enrichment for fuel and weapons. The waste accumulated over several decades has posed a huge storage and disposal problem, and will increase further with any nuclear resurgence. In monetary terms, estimates of the disposal cost have been put at billions, not millions of dollars.

Only about 3 kg from every 1000 kg of processed uranium ore is suitable for use in reactors and traditional types of nuclear weapons. And for every 1kg of low-enriched uranium produced for reactors, 7 kg of waste depleted uranium remains and is classified as intermediate level nuclear waste. As a pure radioactive heavy metal, depleted uranium is far more concentrated, in a purely chemical sense, than naturally occurring uranium ores.

2. Military and other uses of depleted uranium and the effects

It is clear that DU was used on a large scale by the US and UK forces in the Gulf War in 1991, in Bosnia in 1994-1995, in Serbia and Kosovo in 1999, and again in Iraq in 2003. It is suspected that the US also used DU in Afghanistan in 2001. The continued use of A10 'Warthog' aircraft in support of NATO ground troops indicates that DU may be being used. It is likely to have been used in the US intervention in Somalia in the mid-90s. It is also likely that Russia used DU in Afghanistan in the late 80s. Its use has been alleged in Lebanon and most recently in Libya. (i)

Following 1991, American tankers described their 120mm DU rounds as the 'Silver Bullet' because of their efficacy against Iraq's ageing Soviet tanks. However, most NATO countries opted for tungsten kinetic energy weapons due to the environmental cost and political concerns over the use of DU. These concerns have limited their proliferation, with only the five permanent UN Security Council members (plus Pakistan) producing DU munitions and 15 other states known to stockpile them. (ii) Most military DU use has been as ordinance. In tank armour, it is sandwiched between sheets of steel armour plate. It is used as a tamper in fission bombs and as a fissile isotope in some nuclear bombs, e.g., the "neutron bomb". In the mid-1990s, DU was also used in some types of area-denial mines.

The use of DU has not been confined to war zones. DU rounds were test fired at Okinawa, Japan (later removed to Osan Air Force Base in South Korea) up to 400 times daily for 250 days each year. DU weaponry was test-fired 3 km from Socorro in New Mexico and, between the mid-80s and 1994, at the Army Proving Ground in Indiana, leaving some 70 tons of DU shell fragments and contaminated buildings. The Nuclear Regulation Commission allows 7900 DU rounds of 30 mm shells to be fired annually on the Las Vegas side of the Nelis Air Force Base by the Nevada Nuclear Testing Site. As an indication of the quantities of DU weaponry used, the US Navy admitted to the accidental firing of 263 rounds of DU bullets in 1999 at Vieques Island, Puerto Rico. This is less than one normal burst of automatic fire. There is growing international concern about the unacceptable levels of DU weaponry being used, leading to harm to military personnel and civilians, and to adverse effects on essential crop growing areas, ground and drinking water, fauna and flora, and environments exposed to the DU radiation and toxicity created by its use.

Decontamination poses many problems.

It “is impossible to fully remove all the contamination. It is also very costly - the Cape Arza site in Montenegro cost DM 400,000 (almost $280,000 US) and took about 5,000 working person days to decontaminate 480 rounds, which in total took around 12 seconds to fire. Given that even after extensive decontamination many penetrators can remain in the ground, sites may require ongoing testing of groundwater. In some circumstances, estimates of how long this may need to be done run into centuries, and again the testing is very expensive.” (iii)

There is considerable evidence from animal and tissue studies that DU has the potential to damage human and environmental health through both its radioactivity and chemical toxicity. Its uncontrolled release in conflict, a lack of transparency from DU users, and the technical difficulties inherent in decontamination, have all increased the risk of unnecessary civilian exposures. Ongoing reports from Iraq and elsewhere continue to link exposure to DU to increases in certain cancers and birth defects, but the highly detailed epidemiological studies that are urgently required have not been undertaken. Nevertheless, the potential risks from DU weapons are clear.

It has been proposed that DU may prove to be the ‘Agent Orange’ of the twenty first century. Governments and the military have consistently misrepresented the radioactive and toxic effects of DU. Admitting DU can harm would mean multi-billion dollar liabilities for health affected, damage to the environment, and for contamination leading to cleanup costs. Results are already evident.

2.1. Depleted uranium use in areas of conflict and the effects on human health:
Allied forces used substantial quantities of DU weaponry in Iraq in 1991 and 2003; the US admitting using a total of around 400,000 kg during both conflicts. While detailed environmental analysis has not yet confirmed the use of DU in Fallujah, Dr Nawal Majeed Al-Sammarai, Iraq's Minister of Women's Affairs, sent a report on 12 October 2009 to the United Nations General Assembly. (iv)

It stated: “In September 2009, Fallujah General Hospital had 170 new born babies, 24% of whom were dead within the first seven days, a staggering 75% of the dead babies were classified as deformed. This can be compared with data from the month of August in 2002 where there were 530 new born babies of whom six were dead within the first seven days and only one birth defect was reported. Doctors in Fallujah have specifically pointed out that not only are they witnessing unprecedented numbers of birth defects but premature births have also considerably increased after 2003.”

Showing photos of birth defects - cleft palates, elongated heads, a baby born with one eye in the centre of its face, overgrown limbs, short limbs, and malformed ears, noses and spines - Dr Samira Alani told Al Jazeera, the independent Arabic-language news network: “We have all kinds of defects now, ranging from congenital heart disease to severe physical abnormalities, both in numbers you cannot imagine.” Dr Alani, a paediatric specialist at Fallujah General Hospital since 1997, said she had personally logged 677 cases of birth defects since October 2009. Eight days later that number had risen to 699. “There are not even medical terms to describe some of these conditions because we’ve never seen them until now.” (iv)

A study by researchers at the University of Massachusetts and Tufts University concluded: "... human epidemiological evidence is consistent with increased risk of birth defects in offspring of persons exposed to DU." (v)

In North Mitrovica, in Kosovo, population movement works against any study to analyse medical records of illness before and after the conflict. Informally, hospital physicians have reported that the number of patients suffering from malignant diseases has increased dramatically since 1998. (vi) A 2003 study of the impact points of DU weapons by the United Nations Environment Programme (UNEP) in Bosnia and Herzegovina found contaminated drinking water and DU particulates in air samples. (vii)

2.2. Military personnel, depleted uranium and health

In 2004, the UK Pensions Appeal Tribunal Service attributed birth defect claims from a 1991 Gulf War combat veteran to DU poisoning. One year after US veterans began returning from the 1991 conflict reports began of birth defects in offspring. (viii) The American Gulf War Veterans Association says half of the 697,000 US soldiers involved in the 1991 Gulf War have serious illnesses. (ix) Exposure to toxic chemicals is currently claimed as the cause, leading to acute and chronic symptoms. Some 250,000 of the 697,000 who served are afflicted with enduring chronic multisymptom illness. (x) Uranium has been found in the blood and urine of veterans in the US and Canada.

Uranium oxide is insoluble in water. It forms aerosol particles that can travel tens of kilometres in air. Once on the ground, these particles can be resuspended in air when sand or earth is disturbed by motion or wind. Once breathed in, the very small particles of uranium oxide, those which are 2.5 microns or less in diameter (one micron is one millionth of a metre or a 1000 nanometres) can reside in the lungs for years, slowly passing through the lung tissue into the blood.

2.3. Non-conflict effects of uranium / depleted uranium on health

In November 2002, the US Government admitted that residents living in the US from 1958 to 1963 were exposed to fallout from 1200 nuclear weapon tests conducted at the Nevada Test Site resulting in cancer, gene mutation, heart disease, autism, diabetes, Parkinson's, ALS (amyotrophic lateral sclerosis, also referred to as motor neuron disease and Lou Gehrig's disease), asthma, chronic fatigue syndrome, hypothyroidism in new-born infants, obesity and learning disabilities.

High breast cancer rates have been identified in the proximity of nuclear power plants, particularly on the US east coast. (xi) Adverse health effects have been documented in employees and residents living near Puducah, Kentucky; Portsmouth, Ohio; Los Alamos, New Mexico; Oak Ridge, Tennessee; Hanford, Washington. These areas are associated with DU activities. Employees at uranium manufacturing or processing facilities in New York, Tennessee and southwest Colorado have reported adverse health effects similar to those reported by verified Gulf War DU casualties. (xii)

In a study of soil samples taken at Colonie, NY, USA, uranium oxide particles were found to have been dispersed into the environment from a local factory by prevailing winds during the 1960s and 1970s. The contamination footprint has been mapped northward from site, and the uranium in a soil sample from the surface 5 cm, collected 5.1 km NNW of the site, is considerably depleted. The study states that "the total mass of uranium contamination emitted from the factory is estimated to be c. 4.8 tonnes." Uranium has been found in workers 20 years after exposure and a health study is currently underway on local residents. (xiii)

2.4. Effects on the environment of depleted uranium
DU contaminated soil and dust remain long after conflicts end.

Plant and animal tissues, soil, and water samples were collected in six selected regions in the south of Iraq. Analysis confirmed the presence of isotopes from the U-238 decay series in over a third of the collected plant samples. Wild plant samples were found to have radioactive elements at concentrations up to three times the natural background. (xiv)

A report from The Royal Society, London (2002), looking at Uranium in soil in war zones concluded that herbivores ingesting soil whilst browsing may ingest particulate DU present in upper soil layers and vegetations. Fodder crops would also be expected to absorb uranium and DU from soil. The highest level of exposure to DU came from contaminated dust and, for livestock, drinking water derived from contaminated groundwater. (xiv)

In 1991, the largest ever explosion of a DU munitions and tank storage area occurred at a 500-acre base at Doha, Kuwait. Soil from Doha was shipped to the US for disposal at a radioactive waste management facility, as were army trucks hit by 'friendly' DU fire. (xv) Failure to complete the work proficiently caused health issues for occupiers and nearby residents; the camp being near Kuwait City and Kuwait City International Airport. A final cleanup was ordered in 2006. The live DU weapons test range near Dundrennan, Scotland, has left debris from in excess of 6000 radioactive munitions on the seabed of the Solway Firth. By 2002, this had amounted to more than 30 tonnes of nuclear waste. The Journal of Environmental Monitoring (JEM) reported soil samples from the Range

"had uranium concentrations and isotopic signatures indicative of contamination with DU. Furthermore, plants and earthworms collected from above and within contaminated soils respectively also had uranium isotopic signatures strongly influenced by DU, indicating that DU was indeed assimilated into biological tissues."

Earthworms are a crucial part of a healthy ecosystem, aerating the soil and aiding the nutrient uptake of plants, and affecting the food chain. If they are contaminated, it suggests the wider environment is also polluted. (xvi)

3. How depleted uranium contaminates DU is pyrophoric

It ignites on impact and burns at 3000 °C to 5000 °C, creating radioactive dust particles as small as a nanoparticle; that is, one billionth of a metre. Nanoparticles are so fine air filters are ineffective. DU contaminates all living organisms, air, soil and water. It can settle anywhere. The Institute of Nuclear Technology-Radiation Protection of Attiki, Greece, states: "the aerosol produced during impact and combustion of depleted uranium munitions can potentially contaminate wide areas around the impact sites or can be inhaled by civilians and military personnel."

4. The effects of depleted uranium in storage and transport

In the US alone, 686,500 tonnes of DU had accumulated by 2008.xvii DU storage presents long term ecological, health and safety risks.

DU first appears as a byproduct of uranium enrichment processes in the form of uranium hexafluoride (UF_6). At ordinary temperatures and pressures it forms solid grey crystals. It is highly toxic, reacts violently with water to produce uranyl fluoride (UO_2F_2) and hydrogen fluoride (HF) and is corrosive to most metals. It is mostly stored in steel cylinders, which must regularly be inspected for signs of corrosion and leaks, in open air yards close to enrichment plants. The US government is slowly converting its large inventory of depleted UF_6 to solid uranium oxides for disposal. (xviii)

4.1. Accidents with depleted uranium in storage and in transit

Accidents involving DU storage cylinders can result in an uncontrollable, irretrievable release into the environment, potentially affecting workers on site, civilians downwind and the ecology and environment. The most immediate risk to a population is inhalation of hydrogen fluoride (HF); exposure potentially resulting in health effects, from eye and respiratory irritation to death, depending on the exposure level and duration.

Storage accidents involving DU can include: dropped cylinders; sheered or weak valves, and stiff or hardened ring defects; all forms of transport, including forklift. In a country prone to earthquakes, New Zealand should be cognisant of the additional potential for serious accidents.

DU handling accidents on public record include the Mont-Louis which sank in 14 metres off the Belgium coast with 30 drums of UF_6 on board. A UF_6 cylinder ruptured at a commercial uranium conversion facility, Sequoyah Fuels Corp., Gore OK. Thirty one workers were exposed to HF inhalation, one worker died. At the Starmet Corporation, West Concord, Massachusetts, DU was buried in a waste pit and contaminated groundwater at up to 3000 times the official maximum 'safe' level. (xix)

4.2. Exposure to depleted uranium in storage or in transit

Workers at DU storage facilities are daily exposed to low-level external radiation.

In 'The DU Threat' (14 August 2008), author, Thomas D Williams said:

"The (US) Department of Defense (DoD), the nation's biggest polluter, is now cleaning up 29,500 currently or formerly contaminated sites in every state and territory. California alone has 3,912 contaminated sites on 441 current and former DoD installations. Many of DoD's facilities have already contaminated groundwater sources of drinking water. ... The cost to clean up toxic munitions contamination and unexploded ordnance at active and former military installations around the country may reach US$200 billion." (xx)

Safety at storage facilities would have to be stringent. Terrorist action would be a possibility. For example, in 2008, Colombian authorities found a laptop owned by a FARC insurgent group. On it was a reference to nine kilograms of DU, later retrieved. In 2009, the Wall Street Journal reported the theft in Argentina of a canister of Caesium-137, a radioactive isotope which is a fission product of nuclear fission. (xxi)

5. Non-military and other uses of depleted uranium

PSGR is mindful of non-military uses required of DU in New Zealand.

5.1. Medical and scientific use

Because of its high density of 19.1 g/cm3 (1.7 times as heavy as lead) DU is used in science and medicine; e.g. as radiation shielding in medical radiation therapy. Industrial radiography cameras include a high flux gamma radiation source (typically Ir-192) that is surrounded by a DU shield. (xxii)

5.2. Aircraft usage

Aircraft can contain trim weights of between 400 to 1500 kg of DU; e.g. the Boeing 747-100 of the Lockerbie disaster; El Al Flight 1862, which crashed in Amsterdam, containing 282 kilograms of DU; the Boeing 747 cargo jet that crashed during takeoff from Halifax International Airport in October 2004.

PSGR acknowledges that some of New Zealand's military aircraft have DU trim weights and recommend that this be replaced with less toxic or harmless material as soon as practical. Reports say DU is being phased out in commercial aircraft and replaced with tungsten. The fact that the New Zealand Defence Forces, along with countries such as Australia, Canada, Germany, Italy and the Netherlands, have decided to use tungsten or remove DU from their arsenals, brings into question the claims of the US and UK that DU is indispensible as an antiarmour weapon. (xxiii)

5.3. Non-military / domestic usage

Medical facilities, industries and mining operations may use radioactive material and depleted uranium has been used in domestic products. The US Nuclear Regulatory Commission issued draft NUREG-1717: Systematic Radiological Assessment of Exemptions for Source and Byproduct Materials.

Its report covered items containing DU, including "dental ceramics, ophthalmic lenses, glazed ceramic tableware, piezoelectric ceramic, glassware, glass enamel and glass enamel frit, photographic film, negatives and prints, counterweights, shielding in shipping containers, fire detection units, among others." Other uses have been high-temperature superconducting materials, lawn mower parts, and catalysts in furnace tubes at a hydrogen manufacturing plant. PSGR recommends transitioning to procedures and technologies that do not rely on byproducts of uranium enrichment processes. (xxiv)

Extensive, stringent, effective, monitored upgrading of national and placement of international regulations for all usage are urgently needed.

6. Military regulations for uranium / depleted uranium

To suppress opposition, claims that depleted uranium is safe have frequently been based on false premises and misinformation, and do not equate with published and established facts. For example, Pentagon spokesperson, Lieutenant-Colonel David Lapan, speaking about studies into the health risks of DU, told BBC News Online (14 April 2003): "One thing we've found in these various studies is that there are no long-term effects from DU." This despite the fact that a US Army video, produced in 1995, outlined the dangers. (xxv)

The risks associated with DU were identified very early in its development. In September 2002, US Army Chief of Staff, General Eric Shinseki, signed Army Regulation 700-48. It specifies rules for handling DU weaponry and contamination, including destroyed or disabled enemy targets that have been hit and contaminated by DU. It states that local commanders must: "identify, segregate, isolate, secure, and label all RCE (radiologically contaminated equipment). Procedures to minimize the spread of radioactivity will be implemented as soon as possible."

Regulations had already required damaged vehicles to be moved to a collection point or maintenance facility, and "covered and wrapped with canvas or plastic tarp to prevent spread of contaminants." Loose items were to be placed in double plastic bags. The personnel carrying out these tasks must wear protective equipment.

Regulation 700-48 also states: "Radioactive material and waste will not be locally disposed of through burial, submersion, incineration, destruction in place, or abandonment without approval from overall commander." Radioactive equipment must be cleaned up and disposed of as soon as practicable. Other military regulations require DU tank drivers to be medically examined if they are exposed to dust or other radioactive debris. It is reported that US Army and DoD regulations prohibit the use of DU munitions during training. Troops are instructed to avoid sites where DU weapons have been used such as destroyed tanks and exploded bunkers, and to wear masks if they do have to approach. Reports show that the US military's 'green think tank' has been suggesting for some time that alternatives to DU should be sought.

As with the Japanese authorities following the Fukushima earthquake, the US is now allowing its troops who are caught in Level I or Level II DU incidents – for example, in a vehicle struck by DU or cleaning contaminated vehicles – to waive US occupational radiation exposure regulations. (xxvi)

> (See www.bandepleteduranium.org/en/a/281.html; Statement from Britain's current Defence Minister on www.bandepleteduranium.org/en/a/382.html; The Dutch Minister of Defence referring to DU as "heavy polluting stuff" on www.ikvpaxchristi.nl/news/?v=2&cid=1&id=1273&lid=3.)
> http://www.bandepleteduranium.org/en/a/225.html
> http://www.bandepleteduranium.org/en/docs/57.pdf
> http://www.bandepleteduranium.org/en/docs/58.pdf
> http://www.bandepleteduranium.org/en/docs/73.pdf.)

After the Kosovo intervention, Pentagon spokesman, Kenneth Bacon, admitted that DU intended for armour-piercing weapons had also been contaminated by small amounts of plutonium. (xxvii) Plutonium is a radioactive poison that accumulates in bone marrow.

7. The science

Official statements claim that only "safe" low level alpha radiation emanates from depleted uranium. Alpha particles are completely absorbed by human skin, depositing all their energy close to the surface. Beta particles can penetrate up to about 2 cm, depending on their energy. Gamma radiation can penetrate deeply and can generate beta radiation along its track through the body.

Depleted uranium comprises 99.3% 238U. It gives off three forms of radiation: alpha, beta and gamma. The nature of radioactive decay is such that alpha or beta emissions from an atom result in that atom changing into a different element. When an atom of 238U emits an alpha particle it decays into an atom of thorium, 234Th. Thorium is a beta emitter with a half life of 24 days. The thorium beta emitter decays, emitting beta particles and transforming into an atom of protactinium, 234Pa. This is a beta emitter, with a half life of seven hours. Thus, depleted uranium is emitting alpha, beta and gamma radiation. After a few months, the concentrations of thorium and protactinium – known as daughter products - will have built up so that the amount of beta and gamma radiation will each be twice the amount of alpha radiation.

The decay rates of uranium isotopes are expressed as half-lives, the time required for a given amount of the isotope to be reduced by half. A shorter half-life means more intense radiation and, in general, greater potential to damage or destroy cells. The half-life of 238U is 4.5 billion years; equivalent to the life-span of Earth. The half-life of plutonium, which can be part of or contaminate DU weapons, and which is lethal in even microscopic amounts, is 24,000 years. (xxviii)

> See http://ec.europa.eu/health/scientific_committees/environmental_risks/docs/scher_o_123.pdf for details of 238Uranium decay series, p. 38; and natural uranium activity (238Uranium series), page 40.

Decontamination is expensive and technically challenging and the UN Environment Programme has concluded that it is "very difficult to achieve comprehensive detection and complete decontamination of DU at a given site. Even after thorough decontamination efforts have been conducted, some contamination points may remain."

The use of DU weaponry raises serious questions about potential long-term health effects for many generations to come. (xxix) Dispersing DU into the environment in a form that is so readily internalized is profoundly irresponsible and unconscionable. It may kill the perceived enemy, but as has been shown it can also slowly kill one's own personnel and civilian populations. At all stages of handling, DU is dangerous.

Dust particles derived from DU weapons contain high proportions of uranium, typically more than 50%. Uranium is a known carcinogen and induces birth defects. Its chemical toxicity is about a million times greater in vivo than its radiological hazard. DU can be absorbed through skin, lungs and eyes, or ingested in food, and can accumulate in the brain, central nervous system and other body organs. The effects on human health are determined by such factors as the extent of exposure and whether it was internal or external. Normal function of kidney, brain, liver, heart, and numerous other systems can be affected by uranium exposure. Multiple studies suggest leukemogenic, genetic, reproductive, and neurological effects from chronic exposure. Uranium has a strong chemical affinity for DNA phosphate structures. Uranyl ions can bind in the minor groove of DNA and to "zinc finger" structures of some DNA-binding proteins, leading to significant changes in the regulation of genetic expression in selected tissues. (xxx)

The Agency for Toxic Substances and Disease Registry (ATSDR) is the principal US federal public health agency concerned with hazardous substances. In its latest draft guide to uranium's toxicity, the section on genotoxicity is updated (xxxi) (http://www.atsdr.cdc.gov/toxprofiles/tp150-c5.pdf) and a study by Alexandra C Miller of the US Armed Forces Radiobiology Research Institute examines DU as a carcinogen (http://www.afrri.usuhs.mil/outreach/pdf/tungsten_cancer.pdf).

See also: A Review of Depleted Uranium Biological Effects: In vivo studies. Alexandra C. Miller, PhD Uniformed Services University Armed Forces Radiobiology Research Institute http://www.bandepleteduranium.org/en/docs/184.pdf

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8. Depleted uranium and New Zealand's image

In 2009, the Belgian Senate restricted investments by Belgian banks in the manufacturers of DU weapons, land mines and cluster munitions.

On 24 October 2009, the Board of Trustees at the University of Vermont adopted a resolution to withdraw the University's investment funds from companies involved in the production of DU weapons. It cited “indiscriminate use” and “broad adverse effects to human health and the environment” of their use. (xxxii) While the University did not identify the manufacturers or their investors, the largest US producers of DU weapons are General Dynamics, ATK Alliant Systems, and Aerojet Ordnance Tennessee. Their US financiers include the Bank of America, the US Bank, Wells Fargo and Goldman Sachs.

A report released on 5 March 2012 by the International Campaign to Abolish Nuclear Weapons (ICAN) - Don't Bank on the Bomb: The Global Financing of Nuclear Weapons Producers – identifies the significant investors in the 20 major nuclear weapons producers. (See full report http://www.dontbankonthebomb.com/wp-content/uploads/2012/02/DivestmentReport.pdf .) 9 www.psgr.org.nz March 2012

Several investment funds have been established that exclude investments in DU manufacturers in anticipation that DU will be banned. One announcement, made in June 2011, can be read on www.globalpensions.com/global-pensions/news/2082156/msci-launches-range-esg-indices: “Indices have been developed for use by institutional investors who wish to avoid investments in cluster bombs, landmines, chemical, biological, and depleted uranium weapons. A growing number of regulatory and legislative initiatives in Europe and Australia are also considering banning investments in such weapons...”

PSGR suggests such actions against the presence and/or usage of DU could have significant repercussions on the New Zealand economy and exports if sufficient bodies took similar action. Having uranium / depleted uranium in this country in any form, other than controlled, lawful medical and scientific uses, is inconsistent with our Clean Green image.

9. Depleted uranium and international laws

The United Nations Sub-commission on the Prevention of Discrimination and Protection of Minorities passed a resolution that calls for prohibition on the use of DU. There is currently no definitive international treaty to regulate, limit or prohibit the use of weapons containing depleted uranium. However, there is strong scientific debate and concern regarding the impact of the use of such weaponry which suggests there will be a consensus view at an international legal level in the foreseeable future that the use of DU weaponry violates the general principles of the law/s applicable to the use of weapons in armed conflict.

The use of weapons containing DU is already viewed by many as illegal under International Humanitarian, Human Rights and Environmental Laws. Annex II to the Convention on the Physical Protection of Nuclear Material 1980 (operative from 8 February 1997) classifies DU as a category II nuclear material. The storage and transport rules set down for that category indicate that DU is considered sufficiently “hot” and dangerous to warrant these protections. The International Atomic Energy Agency classifies DU as a source material and it is covered in the Safeguards system. The use of DU in weapons can breach one or more of the following treaties: the Universal Declaration of Human Rights, the Charter of the United Nations, the Geneva Conventions including Protocol I, the Convention on Conventional Weapons of 1980, and the Chemical Weapons Convention. In 1996, in a ruling from United Nations High Commissioner for Human Rights, DU weapons were classed as “weapons of indiscriminate effect”. (xxxiii)

There is a consensus view in international legal circles that the use of projectiles, such as those using DU, nuclear warheads and other weapons of mass destruction, violate general principles of the law applicable to use of weapons in armed conflict. Such weapons are universally acknowledged to have the most deleterious consequences to populations and environments. (xxxiv)

Three UN General Assembly resolutions on DU accept that it is a potential hazard. All three resolutions have been supported by New Zealand. (xxxv) It is also significant that four European Parliament resolutions have called for a moratorium on the use of DU, with the most recent in 2008 being supported by 94% of members calling for a ban. (xxxvi)

PSGR proposes that the illegality of DU weapons must be tested by recourse to the general rules governing the use of weapons under humanitarian and human rights law. Parties to Protocol I to the Geneva Conventions of 1949 have an obligation to ascertain that new weapons do not violate the laws and customs of war or any other international law. These include whether the effects of DU can be limited only to legitimate military targets; whether their use is proportionate, and whether 10 www.psgr.org.nz March 2012 their use breaches the expectation that all efforts be made to avoid unnecessary damage to humans and the environment. The International Court of Justice considers this rule as binding as customary humanitarian law.

A review of the legal status of DU can be found on www.bandepleteduranium.org/en/docs/74.pdf; a summary on www.bandepleteduranium.org/en/i/63.html.

10. New Zealand’s position and laws

A New Zealand Herald article (26 June 2010) read: “uranium ore concentrate has been coming through our ports for 30 years, but only at the rate of one shipment per annum ... “until last year the shipments didn't require a permit.” (xxxvii)

It adds: “The National Radiation Laboratory administers importations of radioactive material, but because these shipments are transiting they don't require its consent.” The Ministry of Foreign Affairs and Trade (MFAT) began vetting “shipments only last year (2009) under the Customs and Excise Act which requires MFAT consent to transit strategic goods.”

The Herald reported that the Environmental Risk Management Authority (ERMA), now replaced by the Environmental Protection Authority (www.epa.govt.nz) was only made aware in 2009 (by chance) that the shipments fall under the HSNO Act 1996 which it administered, and ERMA approved applications for the trans-shipments of uranium ore concentrate in steel drums, the drums in sealed containers shipped under deck. The details of the applications suggest the uranium containers form only part of the ships' cargoes; therefore, are port personnel handling any or all of the remaining cargo and is the remaining cargo tested for contamination? There have been no reports of any radiation problems associated with these shipments, but one port Harbour Master has produced photographic evidence of serious damage in storms to containers stored in the bow area of such ships as the uranium ore concentrate is, and proposes that they should be stored in the mid section of the hold of ships.

The National Radiation Laboratory official review document of 1976-1980 indicates ships loaded with uranium began stopping over at the Ports of Auckland, Tauranga, Napier and Nelson at least three decades ago. This coincides with the build-up to the passing of New Zealand's Nuclear Free Zone, Disarmament, and Arms Control Act 1987.

(See National Radiation Laboratory Information Sheet No. 28, http://www.nrl.moh.govt.nz/publications/is28.asp.)

Three uranium ore companies are reportedly involved: Energy Resources of Australia, a subsidiary of British-Australian Rio Tinto group, owner of the Ranger Mine; BHP Billiton Olympic Mine; Heathgate Resources Beverley Mine. Vessels have an allowed 20-day turnaround period under transhipment regulations and the cargo must remain on board. Nuclear physicist, Robert White, cofounder of the Centre for Peace Studies at the University of Auckland and Scientists Against Nuclear Arms, maintains that the shipments breach the Resource Management Act under which it is an offence to store radioactive waste or other radioactive matter in our coastal marine area which includes our harbours. This is still under investigation.

The above situation is a poor reflection on official regulatory oversight, and this trafficking is inconsistent with the spirit of New Zealand's nuclear-free policy. While Australia may claim that it exports uranium ore for use for peaceful purposes only, an end product of processing the ore is depleted uranium, and the main end use for DU is weapons of war.

Relevant New Zealand Acts:

- Resource Management Act (Section 15)
- HSNO (Hazardous Substances and New Organisms Act) 1996, (reprint as at 18 August 2011),
- Customs and Excise Act, (reprint as at 2 January 2012)
- Maritime Transport Act, (reprint as at 1 October 2008)
- Nuclear Free Zone, Disarmament, and Arms Control Act 1987, (reprint as at 20 August 1998)

• Marine Pollution Act 1974 (Sections 21A and 21B)

11. Depleted uranium and New Zealand

The New Zealand government has a duty of care to all New Zealanders and the New Zealand environment to prevent injury and damage derived from depleted uranium. No level of DU can be claimed to be safe.

PSGR acknowledges the contribution made to this statement by Doug Weir, BSc, MA, International Coordinator for the International Coalition to Ban Uranium Weapons www.bandepleteduranium.org/en/index.html.

i. http://www.bandepleteduranium.org/en/a/314.html.

ii. http://www.bandepleteduranium.org/en/i/21.html.

iii. 'A Question of Responsibility - the legacy of depleted uranium use in the Balkans', a report examining user transparency, the capacity of states to manage depleted uranium contamination and the development of health studies, seen through the experiences of Bosnia, Serbia and Kosovo, 11 October 2010 – ICBUW, http://www.bandepleteduranium.org/en/a/342.html. UNEP – Depleted Uranium in Serbia and Montenegro, www.postconflict.unep.ch/publications/duserbiamont.pdf.

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Ends

FURTHER READING:

(1) New report: evidence that depleted uranium can cause cancer now overwhelming
A new analysis of nearly 50 peer-reviewed studies has concluded that the chemically toxic and radioactive weapons constituent depleted uranium (DU) can damage DNA and cause cancer, the report calls for urgent studies into the extent to which civilians are being exposed to the substance.

29 August 2014 International Coalition to Ban Uranium Weapons (ICBUW)

http://www.bandepleteduranium.org/en/depleted-uranium-cancer-evidence-overwhelming

(2) 'Radiation exposure from depleted uranium: The radiation bystander effect.'
Miller AC, Rivas R, Tesoro L, Kovalenko G, Kovaric N, Pavlovic P, Brenner D.

Toxicol Appl Pharmacol. 2017 Sep 15; 331:135-141. doi: 10.1016/ j.taap.2017.06.004. Epub 2017 June 9. https://www.ncbi.nlm.nih.gov/pubmed/28602947

Abstract

Depleted uranium (DU) is a radioactive heavy metal used primarily in military applications. Published data from our laboratory have demonstrated that DU exposure in vitro to immortalized human osteoblast cells (HOS) is both neoplastically transforming and genotoxic. In vivo studies have also demonstrated that DU is leukemogenic and genotoxic. DU possesses both a radiological (alpha particle) and chemical (metal) component but is generally considered a chemical biohazard. Studies have shown that alpha particle radiation does play a role in DU's toxic effects. Evidence has accumulated that non-irradiated cells in the vicinity of irradiated cells can have a response to ionization events. The purpose of this study was to determine if these "bystander effects" play a role in DU's toxic and neoplastic effects using HOS cells. We investigated the bystander responses between DU-exposed cells and non-exposed cells by co-culturing the two equal populations. Decreased cell survival and increased neoplastic transformation were observed in the non-DU exposed cells following 4 or 24h co-culture. In contrast Ni (II)- or Cr(VI)- exposed cells were unable to alter those biological effects in non-Ni(II) or non-Cr(VI) exposed co-cultured cells. Transfer experiments using medium from the DU-exposed and non-exposed co-cultured cells was able to cause adverse biological responses in cells; these results demonstrated that a factor (s) is secreted into the co-culture medium which is involved in this DU-associated bystander effect. This novel effect of DU exposure could have implications for radiation risk and for health risk assessment associated with DU exposure.

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