

Depleted Uranium and Human Health

A recent officially-sponsored visit to New Zealand and the broadcasting of a somewhat sensational video-documentary have renewed concern about the supposed dangers to human health from depleted uranium and, especially, those arising from its military use. This has been the subject of extensive investigation over the last fifteen years by a variety of independent agencies, including the United Nations Environment Programme, World Health Organisation and Britain's Royal Society, as well specialised organisations, such as the Australasian Radiation Protection Society and Sweden's Radiation Protection Institute. The following discussion draws upon the findings of these investigations to offer a considered response to two questions:

Is there a particular health problem associated with the military use of depleted uranium?

Are New Zealand persons who have been deployed to recent battle zones at any significant risk from any exposure they may have had to the remains from depleted uranium munitions?

The content of a June 2005 local publication from the National Consultative Committee on Disarmament ('Is Depleted Uranium an issue for the New Zealand Government?') will also be considered. In the light of present knowledge, it would seem that the answer to all three questions (including that raised by the title of the NCCD pamphlet) is 'No'.

Depleted Uranium

Natural uranium is a mixture of two isotopes, both of which are radioactive. These isotopes are: uranium-238 (99.3%) and uranium-235 (0.7%). Both these isotopes have extremely long half-lives (4½ billion and 700 million years, respectively); that is to say, they are only very feeble sources of radiation. Not only that, the radiation they do emit (alpha radiation) does not penetrate the skin (unlike beta or gamma radiation). Thus, the only danger that could arise from either isotope would be from ingestion.

Uranium-235 is fissile. It is the form of uranium that is required for nuclear explosive weapons and, more particularly these days, for civilian power reactors. For the latter purpose an isotopic mixture that contains 3-4% of uranium-235 is commonly required. This means that the original uranium must be enriched (in respect of U-235) and it also means that a very large quantity of *depleted* uranium (uranium from which the uranium-235 has been taken) is left behind. This Depleted Uranium (DU) is now almost pure uranium-238 and, as such, it has about half the (already low) radioactivity of natural uranium. The production of fuel rods for nuclear reactors (of which there are now some 450 world-wide) gives rise to large quantities of DU, as does the reprocessing of spent-fuel.

It is the fact that DU has a density approximately twice that of lead that makes it such an attractive material for a variety of military and civilian uses. Amongst the latter is its use as a counter-weight or ballast in aircraft or sailing boats, or for shielding X or gamma radiation. Military uses include armour plate and, particularly, high velocity armour-piercing shells.

The dangers from DU

A depleted uranium projectile, striking tank armour, produces a number of effects. Amongst these are blast, heat and metal fragments (shrapnel) inside the tank. Because of the particular properties of uranium, fine material produced by the impact

will also burst into flame and this will produce an aerosol of uranium oxide. For tank crew, this consequence is trivial compared to the direct effects of blast, heat and shrapnel but it is of possible significance to persons who subsequently enter the area and who may ingest such material, taking it into their lungs or digestive system (or, conceivably, into wounds or abrasions). Apart from its feeble radioactivity (as noted above), uranium is toxic. Probably, this latter effect is the more potentially dangerous. Experimental studies in animals and data from occasional human ingestion suggest that kidney damage and possibly death (where no treatment is given) could result from high doses.¹ However, it needs to be noted that 98% of the uranium taken into the alimentary canal is eliminated in the faeces. It is thus very unlikely that an individual could accidentally acquire a health-damaging dose. Various expert reviews of the data undertaken since DU munitions were first used in the 1991 Gulf War have found no evidence of kidney failure associated with chronic exposure to detritus from such munitions.

Radiation effects

Radiation effects come in two kinds. There is the immediate effect of high doses of radiation from exposure to a very active source and there is the long term chronic effect of radiation from embedded internal sources, which may be in small quantities and of low activity. Because of the very low specific activity of depleted uranium, the former possibility is of no relevance to the present discussion. Even in the case of inhaled material, the very low radioactivity of DU (noted above) suggests that discernable health effects are unlikely. According to a 2001 report from the Australasian Radiation Protection Society, there is a practical limit to the amount of respirable dust that can be contained in the lungs at any time (less than 1g) and that, even if this were pure (depleted) uranium oxide dust, this is only six times the natural level from other sources, such as the body's own radioactive potassium-40.² The ARPS review notes that lung cancers due to inhalation have never been observed in persons occupationally exposed to uranium. It also reports calculations performed by the Swedish Radiation Protection Institute on possible health effects from the small proportion of the whole body burden of DU that might be deposited in the bones. The Swedish scientists concluded that neither bone cancers, leukaemias, nor birth defects were to be expected from the very low radiation levels that would be entailed.

The discussion to this point has been mostly concerned with what adverse health effects *might be expected* from the use of DU munitions in recent conflict. This focus is inevitable since the median latency period for radiation-induced leukaemia is around 8 years and around 20 years for solid cancers. Thus, any effects from the Kosovo conflict (1999) and the Iraq War (2003) would not yet have appeared. Even in the case of the Gulf War, it is, as yet, too soon to detect any elevation in general cancer rates if such were going to appear. Of course, this sort of epidemiological study is notoriously difficult since there are so many other variables to be taken into account. These include the general effects of conflict on soldiers and involved civilians and the health consequences of exposure to other chemical agents released in the fighting, or of special medication administered to soldiers for preventative purposes. There is also the general problem of showing that such cases of cancer as do occur represent a statistically-significant variation from the normal. The fact is that 25% of New Zealanders die of cancer and perhaps as many as 50% have some sort of cancer at some time in their lives. Given that this is a general phenomenon, it is likely to be very hard to show a causal link between (say) cancer in veterans and exposure in Iraq, or Kosovo. This will be particularly the case if

veterans generally show the same pattern of cancers as their unexposed fellow-citizens.

The case of claimed genetic defects arising from parental exposure to DU is a particularly interesting one since there is actually no substantial evidence that such an effect can occur in any circumstances (despite what was feared earlier in the atomic age). The most extensive study here has been that of the Radiation Effects Research Foundation which has been studying the effects of radiation on the health of survivors of the 1945 atomic bombing of Hiroshima and Nagasaki (it has laboratories in both cities). After following an original cohort of 120,000 for nearly sixty years RERF researchers have failed to find any such effect.³ Of course, these Japanese studies did find the other effects discussed earlier: leukaemia and cancers of various kinds. These data suggest that birth defects caused by DU are even less likely than the other consequences of DU exposure, discussed earlier.

Background considerations

There is another factor that underlies the sort of professional evaluations that are being reported here and that is consideration of the background radiological influences on human physiology that, with variations, are always present. For instance, the World Health Organisation estimates that the average human adult takes in about half a milligram of uranium per year with his food or water and about half a microgram from breathing air and, of course, we are all subject to cosmic radiation from space, and radiation from the ground and buildings around us (especially if they are made of concrete). There are naturally wide variations in exposure to these factors, depending on whether we fly, have a lot of x-rays or live somewhere where radon gas accumulates in higher than usual concentrations. As a result of this, any additional exposure from (in this case) depleted uranium would only be significant if it was likely to take the individual to a significantly higher exposure. Certainly, it would be very difficult to show a causal link if the doses received were not outside the ordinarily-experienced range.

Radiation exposure has been a given of existence on planet earth since the beginning and, thus, living organisms have evolved biological defence mechanisms which mitigate the potential adverse effects of radiation exposure. Radiation, from whatever source, does damage cell structures and this damage can cause a variety of effects, including cancer but there are also specialised enzymes that repair chromosomes. It seems to be the case that this repair mechanism can protect against radiation damage, if the dose is not too great, and the system is not overwhelmed. This, of course, is not a reason to neglect prudent precautions in the matter of radiation but it does provide a reason why small variations in human exposure to radiation do not give rise to observable health effects. It is undoubtedly a factor in the judgements reported above.

Local commentary

In the light of all this, it is somewhat surprising that a New Zealand Government supported publication should claim that all the health effects discussed above have already occurred and, indeed, that New Zealand persons are at risk from exposure in Iraq. This publication is 'Disarmament Issues', which is said to be an 'occasional publication of the National Consultative Committee on Disarmament'. The whole of its June 2005 issue is devoted to depleted uranium. Interestingly, the discussion makes no reference to sources such as the World Health Organisation, the United Kingdom Royal Society, the Australasian Radiation Protection Society (whose

President is a New Zealander, Dr Andrew McEwen), or the Swedish Radiation Protection Institute, all of whom have done serious scientific work on the issue. Instead the author(s) seem to have relied on a visiting 'expert' (whose visit was also supported out of the public purse) and such sources as the *New Internationalist*. The following quotation is taken from that journal and is sadly characteristic of what is taken to be evidence by both the NCCD authors and the producers of a documentary on the topic, screened in New Zealand in July 2005.

One of the doctors at Basra General Hospital has taken photographs to record all the babies who have been born with deformities. The pictures are horrifying: babies without eyes, without brains, without arms, without legs, without sex organs; babies with internal organs on the outside of their bodies.⁴

It should be clear that this is evidence of nothing (beyond an attempt to influence by shock) without data on the usual incidence of birth defects of this kind in the Basra area, or Iraq, or the Middle East, or, even globally, compared with the number actually being found, and, even with this data, there would have to be some attempt to exclude other causes. Similarly, it is not good enough to merely cite fears without making any attempt to evaluate the likelihood of the feared occurrence, or cite a selected expert. In this case it was a certain Dr Busby, who is quoted as contending that 'DU had caused such a considerable loss of life and long-term suffering amongst both combatants and civilians that it can be termed a weapon of mass destruction'. Apart from the egregious hyperbole here, it is clear from the careful studies of such organisations as the World Health Organisation and the Royal Society that there is no evidence for Dr Busby's claim⁵, so that the mere citing of him as an 'expert' does nothing to sustain it. It is also of concern that 'Disarmament Issues' is reporting that Ministers Marion Hobbs and Mark Burton have apparently agreed to 'further inquiries' with a view to testing New Zealand citizens who have been present in theatres of war where DU 'is in use'. It is to be hoped that the Ministers take these 'further inquiries' seriously, noting, for example, that the WHO fact sheet, referred to above, makes it plain that there is no need for individual exposure assessments in the case of generally-exposed persons.

The committee that approved the expenditure of public funds on what is little more than a shoddy piece of propaganda, ought also to be asking themselves some questions⁶. It seems to this writer that if research is to be undertaken on such issues, and at the public expense, there ought to be some greater care taken in regard to the quality of the results, and that PADET funds have been disbursed at the behest of a Christchurch cabal with a very particular agenda, for far too long.

Conclusion

This is what *The Lancet* said in an article on the toxicity of depleted uranium, published in their issue of 27 January 2001:

It can be safely concluded that, at any conceivable level of uptake, depleted uranium will have no appreciable radiological or chemical carcinogenic potential.⁷

This broadly summarises the conclusions of the various expert international organisations cited above. DU is only feebly radioactive, more feeble, even, than the natural uranium from which it is derived. There is no reliable evidence of radiological or toxicological harm to soldiers or civilians from the use of DU and rational grounds to expect that such evidence is unlikely to appear. In these

circumstances it may well be that there are more serious environmental or disarmament problems to occupy us, rather than indulge in a familiar nuclear phobia.

NOTES

¹ Royal Society Report on Depleted Uranium, Part II (March 2002)

(<http://www.royalsoc.ac.uk>)

² Australasian Radiation Protection Society, 'Potential Health effects of Depleted Uranium in Munitions', February 8 2001 (<http://www.arps.org.au/DU.htm>)

³ <http://www.rerf.or.jp>

⁴ National Consultative Committee on Disarmament, 'Is Depleted Uranium an issue for the New Zealand Government', June 2005, page 3

⁵ See, for instance, World Health Organisation, Fact Sheet No 257, Revised January 2003, 'Depleted Uranium.

(<http://www.who.int/mediacentre/factsheets/fs257/en/print.html>)

⁶ This is the Department of Internal Affairs, Public Advisory Committee on Disarmament and Arms Control, from the 'Rainbow Warrior' PADET funds.

⁷ ND Priest, 'Toxicity of depleted uranium', *The Lancet*, Vol 357, January 27, 2001