

Physicians Press. 1992.

6. Harley NH, Pasternack BS. A model for predicting lung cancer risks induced by environmental levels of radon daughters. *Health Phys* 1981;40:307-316.

7. Harley NH. Radon and lung cancer in mines and homes. *N Engl J Med* 1984;310:1525-1527.

8. Kadhim MA, Macdonald DA, Goodhead DT, Lorimore SA, Marsden SJ, Wright EG. Transmission of chromosomal instability after plutonium-particle irradiation. *Nature* 1992;355:738-40.

9. Köhnlein W, Nussbaum RH. False alarm or public health hazard?: Chronic low-dose exter-

nal radiation exposure. *Medicine & Global Survival* 1998;5:14-21.

10. Protocol additional to the Geneva conventions of 12 August 1949, and relating to the protection of victims of international armed conflicts (Protocol I). Section IV, Article 55.

11. Parker K. Conference statement. International conference: campaign against depleted uranium. Manchester, UK. 4-5 November 2000.

12. US Army. Contaminated and damaged equipment management operations (training video). 1995.



Depleted Uranium: Some Other Perspectives

DU Not A High Priority for Antinuclear Movement

Two years ago, members of anti-nuclear-weapons groups began to ask our views about the alarm raised by the International Action Center in its book, *Metal of Dishonor*, about the use of depleted uranium (DU) penetrators in anti-armor munitions [1]. We were asked whether the hazard was so great that activists should give priority to banning DU.

We read *Metal of Dishonor* and found that, despite the contributions of physicists and radiation-effects analysts, it contained no quantitative risk estimate. We therefore decided to provide the best one we could, using information available in the literature about the health effects of uranium and ionizing radiation.

We concluded that, except for soldiers in vehicles when they are struck, or individuals who crawl around inside such vehicles without adequate respiratory protection for extended periods of time later on, the health effects of DU are likely to be very small. The radiation effects would be well below those of natural background radiation and the chemical effects would be well below the thresholds for known toxic effects [2]. Contaminated armored vehicles and pieces of depleted uranium, however, are potential hazards and should be cleaned up or buried—something which was not done in most cases after Desert Storm and is only being done now in Kosovo.

IPPNW's statement does not disagree with our conclusion—nor similar conclusions that have been arrived at by every peer-reviewed study of which we are aware. It argues, however, for a ban on the use of DU

on the basis that “the military utility of DU weapons for the users does not justify any added health risk for non-combatants, no matter how small.” Of course, no weapon would pass such a test. The IPPNW statement is therefore not helpful in answering the question: “How important is this issue relative to all the others confronting the anti-nuclear-weapons movement?”

The IPPNW statement urges that “the health of military and civilian populations that have been exposed to DU in the Gulf and in the Balkans should be monitored closely in the years ahead.” In our view, this would be useful only for populations for which there is quantitative evidence of significant DU exposure. The best evidence is obtainable through urine tests. It is not too late to conduct such measurements for soldiers or civilians who believe they have been exposed to DU in the Balkans. Samples collected from 171 Germans before and after their service in Kosovo showed no increase in uranium concentration [3]. There is no justification for a full-scale epidemiological study of such a population.

The IPPNW statement also raises the issue “that the DU munitions used in the Gulf war and in the Balkans were tainted with plutonium, U-236, and other substances far more intensely radioactive than U-238.” Here again, a quantitative perspective would be useful. The dose from inhaled DU contaminated with 1 part per million (ppm) plutonium or 0.3% U-236 would be about 50% greater than the dose from an equal amount of uncontaminated DU. The maximum contamination measurements that we have seen are about an order of magnitude lower than these levels; concentrations measured in samples of DU metal used for

tank armor are several orders of magnitude lower¹ [4].

In summary, the IPPNW statement provides no basis to change our conclusions:

1) The health risks from DU are not great enough to make efforts to ban its use a high priority for the anti-nuclear-weapons movement; but

2) DU-contaminated vehicles and pieces of DU on the battlefield should nevertheless be removed or buried to minimize exposure to those who subsequently may live in or visit the area.

—Steve Fetter, Frank N. von Hippel
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References

1. Caldicott H, Kaku M, Gould J, Clark R. Metal of dishonor: how depleted uranium penetrates steel, radiates people and contaminates the environment. New York: International Action Center. 1997.
2. Fetter S, von Hippel F. The hazard posed by depleted-uranium munitions. *Science and Global Security* 1999;8:125–161. Available online at www.princeton.edu/~cees/arms/SciGloSec.shtml.
3. Roth P, Werner E, Paretzke HG. Untersuchungen zur uranausscheidung im urin. Available online at www.gsf.de/Aktuelles/Presse/uran.pdf.
4. Hightower JR, O'Connor DG, Dole LR, Pawel SJ, Lee DE, Schmoyer RL, et al. Strategy for characterizing transuranics and technetium contamination in depleted UF₆ cylinders (ORNL/TM-2000/242). Oak Ridge, Tennessee: Oak Ridge National Laboratory. 2000. Online at www.public.usit.net/dolelj/ORNL-TM-2000-242.pdf.

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Depleted Uranium and the Geneva Conventions

The statement on depleted uranium by the executive committee of IPPNW is balanced and useful. I have difficulties, however, with the statement that the use of DU weapons should be considered “a form of ecological warfare prohibited by the Geneva Conventions.” Article 55 of Protocol I to the

1. An Oak Ridge study found that the highest ratios of U-236/U-235 and Pu-239/U-238 in the solid “heels” left in containers of the enriched uranium hexafluoride produced by the Paducah enrichment plant, where uranium from US plutonium-production reactors was enriched, correspond respectively to 0.01% U-236 and 0.1 ppm Pu-239 in DU containing 0.2% U-235.

Geneva Conventions (1977) prohibits “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.”

I have not found reliable evidence for the assumption that the areas contaminated with DU will be unsuitable for human habitation or agriculture because of the radioactivity. The increase in background radiation to which the population will be subject is negligible. The remaining weapons containing DU are more of a concern. Children are likely to play in the abandoned tanks containing substantial amounts of DU in the form of fine hard dust, and may collect shells and fragments containing of DU. The tanks and ammunition should be collected and removed.

Like lead, uranium is taken up and circulated in the ecosystems to a very limited degree. The chemical toxicity of the heavy metal uranium is somewhat similar to that of lead. In many countries children have suffered brain damage after eating lead in flaking paint in houses. While uranium in artillery shells is much harder than lead and the chances of ingestion are smaller, chemical toxicity is a consideration.

A careful study has been published on 29 US soldiers who were exposed to “friendly fire” that destroyed 15 US tanks in the Gulf war, and who were examined seven years later [1]. These servicemen carry DU in their bodies as dust or as fragments in amounts much larger than can be expected for the civilian population. Despite this, the increase in radioactivity in their bodies was far below the level contributed by the background. Very sensitive indicators of kidney damage were normal. In one of several tests for cognitive function there was some degree of dysfunction.

Physicians are on safe ground when we demand that DU should not be used in weapons until its possible chemical and physical toxicity is better known. We have however no evidence that DU is causing environmental danger of a type and degree covered by the Geneva Convention.

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Reference

1. McDiarmid M et al. *Environ Res Sect A* 2000;82:168-180.