Depleted Uranium
Scandal or Scare?

Price 20p

What is depleted uranium?

The richest veins of uranium ore occurring naturally can contain up to 3% of uranium by weight. In the pure form it contains about 99.3% of U^{238}, 0.7% of U^{235} , and a trace of U^{234}. U^{238} is so called because each atom contains 92 protons and 146 neutrons which, added together, give an atomic weight 238. U^{235} and U^{234} are 'isotopes' or variations of uranium. They contain 3 and 4 fewer neutrons respectively, are more radioactive, and more easily destabilised. Depleted uranium (DU) is uranium depleted of its isotopes: almost pure U^{238}. It is obtained from spent nuclear fuel and, because there is plenty around and few uses, it is cheap.

Why is it used?

It is used because it is very heavy, in fact the heaviest of all metals. Its density or, more precisely, its specific gravity, is almost 19 which means a cupful of DU would be 19 times as heavy as the same cupful of water (and 1.7 times as heavy as lead). It is ideal for any purpose where one wants as much weight in a small space as possible, for example in yacht keels, flywheels, counterweights on aircraft, and artillery shells. It is easily cast and machined.

How dangerous is it?

DU is hardly radioactive at all. The most common measure of radioactivity is what is known as the 'half life', the time taken for a material to lose half its radioactivity. The half life of DU is over 4 billion years. Moreover the radioactivity is mostly in the form of so called *alpha* particles which are the least penetrating form of radioactivity. *Alpha* particles can be stopped by a sheet of paper and human skin. DU may contain traces of other isotopes. The UN found 0.0028% of U^{236} in one sample, but it is considered quite acceptable to handle DU shells with *bare hands*, though the maximum allowable *annual* dose of 20 millisieverts for uranium workers would be reached after 8 hours. The hazard is reduced even further if the bare metal is covered with acrylic paint, zinc or nickel.

Due to its exceptionally low radioactivity DU is commonly used as a shield from other more active sources. It is used as part of the armour protecting American Abrams tanks. DU need pose no hazard if treated with care.

What about the battlefield?

DU is hazardous if ingested into the lungs or stomach in the form of dust. Good working practices can ensure that dust is controlled when, for example, one is machining the metal in a workshop, but this is not possible on the battlefield. Uranium is poisonous just like lead and tungsten. Taken into the stomach in sufficient quantities the DU dust can cause kidney failure.

In addition very fine particles, especially in the 1-5 microns range can find their way deep into the lungs. Here the protection afforded by the skin is absent and the alpha particles can invade the lymph nodes and potentially initiate cancer.

Uranium shells can burn on impact forming oxides. UO_2 particles are heavy and drop quickly to earth, but U_3O_8 particles are in the 1-50 micron range and can be dispersed widely by the winds. It is true of course that tank crews are more likely to be killed by the shell's explosion than any dust, but fitters reclaiming spare parts or curious villagers, especially children, risk stirring up the dust and inhaling it into lungs and stomach.

Is DU the cause of Gulf War syndrome?

If DU were the cause of Gulf War syndrome or post war sickness in local populations, we should expect most patients to exhibit *kidney* related problems or leukemias. In fact it seems the syndrome has not one but several different causes and symptoms. This, of course, makes it more difficult to pin anything down. Some soldiers may have been affected by biological and chemical releases believed to have been made by the Iraqis, some by the cocktail of vaccinations given to the troops, some by mental factors and others by a combination of these.

It is impossible to replicate battlefield conditions for a research trial, but it is almost 150 years since Florence Nightingale demonstrated in the Crimea that it was just as important to save soldier's lives *off* the battlefield as on it. For a long time the MoD appeared slothful both in uncovering the causes of war related health problems and its willingness to as much as possible to 'make the battlefield safe' after a conflict ends.

Are there alternatives?

Shells will be needed as long as conflicts continue. The only real alternatives to DU are lead and tungsten, both toxic and perhaps more dangerous because the dust particles (not being radioactive) are more difficult to detect. Supplies of tungsten are also limited, with over half coming from China. As with many things, closing one option may only open the door to something worse. Clearance of battlefields after conflict would be much more useful.

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