HEALTH PHYSICS SOCIETY

Specialists in Radiation Safety

DEPLETED URANIUM

HEALTH PHYSICS SOCIETY FACT SHEET

In recent years, depleted uranium (DU) is frequently noted in the news because of extensive use on the battlefields of Kosovo and Iraq. There is a great deal of concern about the medical effects of DU exposure. In this fact sheet, we will try to explain the significance and validity of these concerns.

What is depleted uranium?

Uranium (U) is a dense, weakly radioactive metallic element that exists naturally in our environment. Uranium is found everywhere in nature and particularly in rocks, soil, water, and air, as well as in all plants, animals, and humans.

- Natural uranium consists of a mixture of three isotopes, which are identified by the mass numbers ^{238}U (99.27% by mass), ^{235}U (0.72%), and ^{234}U (0.0054%).
- Enriched uranium is used as fuel in nuclear power reactors generating electricity. The content of ^{235}U must be enriched (or increased) from 0.72% (as is found in natural uranium) to about 1.5-3%. This material cannot be used to make nuclear explosives. After removal of the enriched fraction, the remaining uranium contains about 99.8% ^{238}U, 0.2% ^{235}U, and 0.001% ^{234}U by mass. This is referred to as depleted uranium or DU.
- Depleted uranium is uranium metal whose isotopic composition has been changed by removal of the ^{235}U and ^{234}U such that the fraction of ^{238}U increases. Depleted uranium is less radioactive than natural uranium.
- Spent uranium fuel from certain nuclear reactors (not commercial reactors) is sometimes reprocessed in plants for uranium enrichment. Some reactor-created radionuclides may consequently contaminate the reprocessing equipment and the resulting DU. Under these conditions another uranium isotope, ^{236}U, may be present in the DU together with trace amounts of other elements.

What is depleted uranium used for?

- Civilian uses – Due to its high density, about 60% more dense than lead, the main civilian uses of DU include counterweights in aircraft and containers for the transport of radioactive materials. Some depleted uranium is used industrially as stabilizers in boats and yacht keels.

- Military uses – DU is used for defensive armor plates on tanks and troop carriers because of its high density. Also, it is used for armor-penetrating bullets and shells because of its high density and its ability to self sharpen as it penetrates its target.

Are there any health effects associated with exposure to DU?

DU behavior in the body is identical to that of natural uranium. Uranium and DU are considered internal hazards. Therefore, inhalation and/or ingestion of these materials should be minimized.

In general, natural U and DU are considered chemical health hazards, rather than radiation hazards. The exception is the case where DU is inhaled in the form of tiny insoluble particles, which lodge in the lungs and remain there for very long times. DU is less of a radiation hazard than natural U because it is less radioactive than natural U. Direct (external) radiation from DU is very low and only of concern to workers who melt and cast U metal.

DU used in commercial civilian applications does not present a significant health hazard because it is usually in solid

form and not available for inhalation or ingestion. Military operations with DU, however, may contaminate soil, groundwater, and breathing air. When used as a weapon, small particles of DU may be produced. These particles have high density and most fall to the ground very close to where they are produced.

Studies have been made of workers and other persons who have ingested or inhaled uranium. There is no known association between low-level DU exposure and adverse health effects, including birth defects. In large quantities, DU exposure can cause skin or lung irritation, but only soldiers in the immediate vicinity of an attack that involves DU are potentially exposed to these levels of contamination. People who live or work in areas affected by DU activities may inhale or consume contaminated air, food, or water. Soldiers with wounds containing fragments of DU shrapnel may develop effects at the wound sites. However, the risks to these sites decrease quickly once the DU is removed. Persons exposed to very large inhalation doses of uranium have shown minor, transitory kidney effects, which typically disappear within days to a few weeks after exposure. Persons inhaling insoluble particulates that lodge in the lung may be at elevated risk of developing lung cancer many years later, particularly if they are smokers. But lung cancer has yet to be demonstrated in uranium workers or others exposed acutely or chronically to uranium.

A group of Gulf War veterans who have small DU fragments still in their bodies continue to be followed by government scientists to determine whether there will be long-term health effects. As of early 2005, only subtle but clinically insignificant changes in measures of kidney function have been observed. One common observation is a persistent elevation in the amount of uranium measured in the urine more than 10 years after exposure. This reflects the continued presence of DU in wound sites and its ongoing low-level mobilization and absorption to blood.

In summary, some minor health problems have been observed following exposure to DU, but ONLY with high levels of exposure. Exposures to airborne DU or to contaminated soil following military use are not known to cause any observable health or reproductive effects.

For detailed information on DU, refer to the United Nations Web site: http://www.who.int/ionizing_radiation/env/du/en.

Also refer to WHO Guidance on Exposure to Depleted Uranium (WHO/SDE/OEH/01.12, 2001): http://www.who.int/ionizing_radiation/en/Recommend_Med_Officers_final.pdf

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* The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.

Depleted uranium is currently on the minds of many people due to its use as a weapon, first in the Gulf War and now in Iraq. In response to many questions and concerns from the public, the Health Physics Society (HPS) Public Education Committee (PEC) has issued this new fact sheet on depleted uranium here and on the HPS Web site under Public Outreach (http://hps.org/documents/dufactsheet.pdf). This is the sixth fact sheet prepared by the PEC.

The PEC is responsible for gathering, organizing, and presenting information within the Society's objectives. The PEC facilitates dissemination of accurate, unbiased information on ionizing radiation by preparing educational materials as suggested and/or approved by the Scientific and Public Issues Committee. Current PEC members Marcia Hartman, Dan McGrane, Ralph Ochoa, Ali Simpkins, Mark Somerville, Vince Williams, Rob Woodard, and Board Liaison Andrew Karem developed this latest fact sheet. Other individuals involved in preparation of the Depleted Uranium Fact Sheet include Ron Kathren, CHP, an expert in the field.