Depleted Uranium - Medical

FACT SHEET 26-004-1116

GENERAL INFORMATION	Uranium is an element found naturally in soil, water, and mineral deposits. It is a slightly radioactive substance composed of 3 naturally occurring forms: U-238, U-235, and U-234. All three forms are found together in uranium ore. Depleted uranium (DU) is what remains after the more radioactive forms, U-234 and U-235, are removed from uranium ore when enriching uranium. Enriched uranium, which contains the more radioactive forms, is primarily used as fuel in nuclear reactors. All uranium, not just DU, is mostly U-238. Natural uranium and DU differ only in the amount of each form. Depleted uranium is roughly half (60%) as radioactive as natural uranium because there is less of the more radioactive forms (U-234 and U-235). Its chemical properties, which are the same for all forms of uranium, are responsible for many of the health effects of concern. Depleted uranium might also contain trace amounts of U-236 and other substances, such as plutonium, americium, and technetium. The amounts of these other substances are so small that they have no effect on health or the environment and are very difficult to measure. Everyone has uranium in their diet, and this uranium can be measured in the urine.
ROUTINE USES IN THE DEPLOYED SETTING	The United States Armed Forces have used DU in the manufacture of munitions, armor, and armor-piercing projectiles. Depleted uranium projectiles are capable of readily penetrating armor. Armor constructed with DU provides a high degree of shielding and resistance to penetration. During the 1991 Gulf War (GW), DU containing munitions were used on a large scale for the first time.
EXPOSURE SCENARIOS	When a vehicle is hit by a DU projectile, dust, smoke, fumes, and particles are formed. The inside of the damaged vehicle will therefore be contaminated with DU particles. This material can be found in many sizes including those that can be easily inhaled or ingested. There is also the possibility that the occupants of the vehicle can be injured by fragments of material containing DU. In the event of a vehicle fire, the heat of the fire can cause onboard DU ammunition to burn and spread DU contamination. Personnel in, on, or near (less than 50 meters) an armored vehicle when the vehicle is hit by a DU projectile are considered at risk for exposures to DU that require evaluation by urine bioassay. These types of exposure are categorized as Level I. Personnel in Level I have the highest potential for DU intakes that might exceed occupational exposure limits and guidelines. Level I personnel may internalize DU through inhalation, ingestion, wound contamination, and wounds (embedded fragments). Some crew members may be left with multiple tiny fragments of DU or DU-contaminated fragments embedded in their muscle and soft tissue. Other Soldiers may also be exposed to DU during operations to salvage combat vehicles that have been disabled by DU rounds. Personnel who routinely enter damaged vehicles in recovery operations or fight fires involving DU are categorized as exposure Level II and also require a urine bioassay. Simply riding in a vehicle with intact DU munitions or DU shielding will not result in significant intakes of DU. These and other similar scenarios are categorized as exposure Level III and urine bioassays are optional based on health care provider and patient concerns.

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SIGNS AND SYMPTOMS OF ACUTE AND CHRONIC EXPOSURE	The clearest sign of exposure to DU is the presence of DU in the urine and feces, particularly the urine. The major health concerns about internalized DU relate to its chemical properties as a heavy metal rather than to its radioactivity, which is very low. As with all heavy metals, the hazard depends mainly upon the chemical form, the amount taken into the body and the solubility of the DU particles within the body fluids. It has been recognized that very high uranium intakes can cause kidney damage. Chronic exposure by inhalation represents potential radiological hazard to the lung. Uranium miners have an increased risk of lung cancer after long term exposures to natural uranium and its radioactive progeny (including radon); however, this increase in lung cancer risk is attributed to radon and not to the radioactivity of uranium. DU is less radioactive than natural uranium. There are no acute health effects for Level I and II expected; however, in rare instances Level I exposures could cause acute effects to the kidney.
MEDICAL TREATMENT	Casualties may have DU contamination on their clothing and skin. Under no circumstances should casualty extraction, treatment, or evacuation be delayed due to the presence of DU. Standard aidman procedures for treating wounded personnel should be followed. Wounds and burns should be cleaned and debrided using standard surgical procedures. Normal "universal precautions" (surgical gloves, surgical mask, and throwaway surgical gowns) are more than adequate to protect medical personnel from accidental contamination with DU. Items contaminated with DU should be disposed of using standard universal precaution procedures. Embedded DU fragments should be removed using standard surgical criteria except that large fragments (greater than 1 cm) should be more aggressively removed unless the medical risk to the patient is too great. The short-term consequences of retained DU fragments do not justify an aggressive approach during the early treatment of wounds. Appropriate treatment of the wound with removal of any easily accessible fragments should be performed. In the care of acute wounds, surgical judgment should avoid the risk of harm in removal of other fragments -even when known to be DU. Depleted uranium fragments may always be removed at a later date. Fragment sizes can vary from several millimeters to 1–2 cm and are readily discernible by x-ray examination. Individuals who have been potentially exposed to DU by inhalation should not have any acute symptoms and should be treated only if injured. Urine bioassay to assess exposure should be performed in accordance with existing Army and DOD policies. Individuals with chronic DU exposure will be referred to the Department of Veterans Affairs (VA) for additional surveillance. Treatments with chelating agents such as EDTA and DTPA have been shown to help exclude systemic DU. Additional information on the medical management of radiological casualties can be found at the Armed Forces Radiobiology Research Institute web page: https://www.usuhs.edu/sites/default/files/media/afrri/pdf/4edmmrchandbook.pdf.
LONG TERM MEDICAL SURVEILLANCE REQUIREMENTS OF HEALTH EFFECTS MONITORING	Since 1993, the VA has been following a number of Gulf War veterans who were seriously injured in fratricide incidents involving DU (Category I). This cohort of Gulf War veterans contains about 80 individuals. These veterans are being monitored at the Baltimore VA Medical Center. In the 2013 surveillance project, 14 DU veterans were found to have higher than normal levels of uranium in their urine. These veterans are being followed very carefully and numerous medical tests are being done to determine if the DU fragments are causing any health problems. For all veterans in the program (including those with retained DU fragments), all tests for kidney function have been normal (though small differences in some urinary biomarkers have been detected in the higher urinary DU group). In addition, the reproductive health of this group appears to be normal in that all babies fathered by these veterans between 1991 and 1997 had no birth defects.
SPECIAL RISK COMMUNICATION INFORMATION	Depleted uranium aerosols are only one of many potentially hazardous substances that Soldiers may be exposed to during deployment and combat operations. There are two potential hazards associated with exposure to large amounts of DU aerosols or retained fragments. The primary concern is the effect associated with heavy metal toxicity, much like that seen with tungsten, lead, and cadmium on the kidney. The second area of concern is with DU's low-level radioactivity. Follow-up of individuals with retained DU fragments have not shown evidence of adverse health effects related to internalized DU. Those individuals who show elevated DU in the screening urine bioassay are being followed as a precaution.