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In response to concerns regarding the potential health effects of depleted uranium (DU) exposure in U.S. soldiers involved in combat incidents that involved DU munitions or DU armored vehicles, the U.S. National Research Council (NRC) was called upon to review current toxicological, radiological, epidemiological and toxicokinetic data on DU and to evaluate the U.S. Army’s Capstone report entitled “Depleted Uranium Aerosol Doses and Risks.” The Army Capstone report provides estimates of exposure and health risks associated with the inhalation and ingestion of DU oxide dust generated by the penetration of DU armored Abrams tanks and Bradley fighting vehicles by DU munitions. Estimates of DU exposure were based on data generated by an Army DU Aerosol Characterization study in which air and surface dust samples were collected from multiple positions within and outside Abrams tanks and Bradley fighting vehicles during and immediately following the penetration of the vehicle by a large-caliber DU penetrator. Collected samples were characterized to determine particle concentration, size distribution, solubility and chemical composition, all of which play an important role in the potential toxicity of DU oxide particles.

In its review of the Capstone report, the NRC committee determined that the Army’s exposure estimates generated from the air sampling data were reasonable and appropriate for a health risk analysis of DU oxide-associated adverse health effects in soldiers in, on, or near vehicles penetrated by DU munitions. Based on a review of the literature, the committee confirmed that the renal system is the most sensitive target organ for acute effects of exposure to soluble DU particles and that transient renal proximal tubule dysfunction can occur at exposure doses giving rise to renal U concentrations as low as 1 ug/g. Glucosuria appears to be the most persistent effect observed during recovery of renal function.

Radiation dose estimates derived from theoretical risks of alpha particle radiation and predicted lifetime cancer mortality risks reported in the Capstone Report were within a factor of 2 of those determined independently by the NRC committee. The median lifetime cancer mortality risk estimate for soldiers in, on or near an Abrams tank when it was penetrated by a DU munition was 0.45%; for the 90th-percentile exposure scenarios, the estimated lifetime cancer-mortality risks approached 0.6%. This relatively low calculated risk is consistent with epidemiological studies indicating an absence of appreciable risk of cancer in humans occupationally exposed to uranium and results of animal studies suggesting insoluble U is weakly carcinogenic in animals.

Recommendations by the NRC committee included continued health surveillance of the DU-exposed Gulf War cohort of US soldiers involved in “friendly-fire” incidents, and additional follow up of U exposed populations using improved exposure assessment methodology and an examination of subgroups of workers for selected health outcomes including renal function, bone metabolism and genotoxicity.