

low. The recommendations to the national authorities, in all the cases studied were to collect any depleted uranium ammunition or fragments and any war equipment which have been in direct contact with these ammunitions and isolate them from the public in appropriate locations until it can be processed as low level radioactive waste and eventually safely disposed of. Some environmental remedial actions like covering of areas with uncontaminated soils could be convenient at some particular locations, depending on the use of the land.

8. After the conclusion of the investigations in which IAEA participated, the national authorities in the affected regions should have had the competence and equipment to carry out the necessary monitoring, survey and remedial activities in relation to depleted uranium. This was actually observed in all the cases studied.

9. IAEA together with UNEP and WHO provided coordinated response to the request of its Member States to assess the post-conflict radiological risk to the public and the environment from the contamination of territories with depleted uranium residues. IAEA generally concluded that the radiological risk was not significant and could be controlled with simple countermeasures conducted by national authorities. It was also observed that in a post-conflict environment where the social and economic disruption is high, the radiation fear linked to the presence of depleted uranium residues further increases the anxiety of the population. In many of the concerned countries the results of the radiological evaluations provided a basis for public reassurance due to the low significance of the radiological impact.

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Background

1. The main civilian uses of depleted uranium include counterweights in aircraft, radiation shields in medical radiation therapy machines and containers for the transport of radioactive materials. The military uses of depleted uranium for defensive armour plate is based on its high density as well as ability to ignite on impact if the temperature exceeds 600° C.

2. Earlier reports of the international organization (IAEA, UNEP and WHO) focused on environmental and health impact of depleted uranium for example in Bosnia and Kuwait. Depleted uranium concentration levels in soil exceeding background levels of uranium was reported close to locations of depleted uranium shrapnel or remains of tanks left after military operations. Over time, the depleted uranium concentration is dispersed into the wider natural environment by wind and rain. People living or working in affected areas may inhale re-suspended contaminated dusts.

Potential health effects of exposure to depleted uranium

3. Average annual normal intake of uranium by an adult is estimated to be about 500 µg from ingestion of food and water and 0.6 µg from inhaling air. Ingestion of small amounts of depleted uranium-contaminated soil by small children may occur while playing in post-conflict zones. Occasional exposure of depleted uranium through the skin contact does not result in any ascertainable health effect.

4. Because depleted uranium is only weakly radioactive, chemical toxicity is the prevailing concern. The kidneys are the main site of potential damage from chemical toxicity of uranium. Limited information from human studies indicates that the severity of effects on kidney function and the time taken for kidney function to return to normal both increase with the level of uranium exposure.

5. To date, no consistent evidence of adverse effects of depleted uranium has been reported for the skeleton or liver. No reproductive or developmental effects have been reported in humans. Long-term follow-up studies on military personnel wounded during military operations and living with depleted uranium-containing fragments embedded in soft tissue show elevated level of depleted uranium in urine. Although uranium released from embedded fragments may accumulate in the central nervous system tissue, and some animal and human studies are suggestive of effects on central nervous system function, it is difficult to draw firm conclusions from the few studies reported.

6. In 2001, WHO produced the report "*Depleted uranium: sources, exposure and health effects*", which will be updated in 2008. New evidence from recent epidemiological and experimental studies will be reviewed, however, no major deviation from previous conclusions is expected.

Monitoring and treatment of exposed individuals

7. For the general population, neither civilian nor military use of depleted uranium is likely to produce radiation doses significantly above normal background levels. Therefore, individual exposure assessments for depleted uranium will normally not be required. Exposure assessments based on environmental measurements may be useful for monitoring and the information and reassurance of the public.

8. When an individual is suspected of having been exposed to depleted uranium at a level of dose significantly above the normal background level, an assessment of depleted uranium exposure and kidney function may be required. This is best achieved by analysis of daily urine excretion.

9. In conjunction with the United Nations Joint Medical Service, WHO has developed guidance on exposure to depleted uranium for medical officers and for programme administrators. These recommendations provide advice on the need for special medical examinations or monitoring the health of populations living in conflict areas with possibly significant exposure to depleted uranium (see www.who.int/ionizing_radiation/en/Recommend_Med_Officers_final.pdf).

Recommendations

10. Following military conflicts, levels of depleted uranium concentration in soil and air might be detected in affected areas even after a few years. The area contaminated with armour, tanks, shrapnel, etc. should be monitored. Where justified and possible, clean-up operations in impact zones should be undertaken if there are substantial numbers of radioactive projectiles remaining and where qualified experts deem contamination levels to be unacceptable. If high concentrations of depleted uranium dust or metal fragments are present, then areas may need to be cordoned off until removal can be accomplished. Such impact sites are likely to contain a variety of hazardous materials, in particular unexploded

ordnance. Due consideration needs to be given to all hazards, and the potential hazard from depleted uranium kept in perspective. In general, disposal of depleted uranium should follow appropriate national or international recommendations.

11. Particular emphasis should be placed on the protection of children. Small children could receive greater exposure to depleted uranium when playing in or near depleted uranium impact sites. Their typical hand-to-mouth activity could lead to high depleted uranium ingestion from contaminated soil.

12. Risk communication campaigns may be needed in the affected areas to educate local populations on potential hazards and risks for their health. This is especially important in areas where scrap metal is collected and melted for sale. This may impose a significant risk to health of people and especially children due to the inhalation of toxic vapours resulting from metal melting. National authorities for the affected post-conflict zones should be advised to take action to control and regulate such activities in local communities.
