ISOTOPE RATIOS, ENVIRONMENTAL PROCESSES AND DEPLETED URANIUM EXPOSURE ASSESSMENT

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Between 1958 and 1982 depleted uranium (DU) metal was processed at a National Lead plant in Colonie, NY, USA. Combustion of scrap metal resulted in emissions of uranium particulates. The ATSDR concluded that these emissions could have increased the risk of certain health effects for Colonie residents [1].
Parrish et al. [2] demonstrated that it is possible to detect the excretion of DU with urine more than 22 years after inhalation exposure. Isotope ratios demonstrate that an exposed population exists at Colonie, whereas significant exposure was not common amongst Gulf War Veterans. Thus analytical techniques developed in geochemistry laboratories offer medical researchers evidence to underpin proposed investigations into the health effects of DU exposure.
High precision isotope ratios obtained by MC-ICP-MS also provide evidence for the origin of the DU processed at Colonie [3, 4]. This information helps to constrain the timing of likely exposures to between 1967 and 1982. The sensitivity and ion counting options of the Neptune plus with Jet Interface improves the analytical precision that is possible from the very small analyte quantities that are available in bioassay and individual particulate samples.
EXAFS data and SEM images reveal the mineralogy of the particulate contamination. These properties control how the material will behave in the environment and also in the lungs of exposed individuals [5]. It is possible to trace the environmental processes that control the distribution of depleted uranium contamination in soils using lower precision isotope ratios obtained by quadrupole ICP-MS. This is illustrated by soil profiles and contamination maps of the area surrounding the former NLI site [6]. The isotopically distinct composition of the depleted uranium allows for the quantification of the degree of contamination relative to the variable background concentrations of natural uranium present in environmental samples.

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