

Enhancement of Plutonium Excretion Following Late Ca-EDTA/DTPA Treatment

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Individuals with significant internal deposition of plutonium are likely to be treated with intravenous injections of chelating agents such as the calcium or zinc salts of ethylene diamine tetraacetic acid (EDTA) and diethylene triamine pentaacetic acid (DTPA). Chelation with Ca-DTPA is known to enhance urine excretion of plutonium by up to a factor of 100. The enhancement factor (EF) may be higher for soluble plutonium compounds and varies significantly among individuals. Knowing the EF is critical for interpretation of bioassay data collected during the chelation therapy. The EF is an important parameter for estimation of radionuclide intake and radiation dose assessment using standard biokinetic models. In current practice, and in the absence of individual-specific data, a value of 50 is recommended. In this single-case study, plutonium EFs were estimated for late treatments with EDTA (9 mo after intake) and DTPA (7.2 y after intake). These treatments consisted of 4 g of Ca-EDTA daily for 5 d, and of 1 g of Ca-DTPA weekly for 11 wk. In the case of EDTA treatment, the Pu EFEDTA ranged from 71 to 159, with a geometric mean of 101. For DTPA, the Pu EFDTPA ranged from 8 to 192, with a geometric mean of 33. Enhancement factors estimated in this work are in the range of published values. The finding that EFDTPA is lower than the EFEDTA is likely due to decreasing over time of systemic plutonium available for complexation.

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