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Impact of Eu(III) and U(VI) as well as HEDP and DTPA on human and rat kidney cells in vitro

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In case radionuclides (RN) enter the food chain and are incorporated by humans, they pose a possible health risk due to their radio- and chemotoxicity. When RN incorporation occurs, decorporation agents (DA) play a critical role in health maintenance and reduction of toxicological damage. Since excretory organs are highly exposed to incorporated RN, we performed *in vitro* cell culture experiments with renal cells from human (HEK-293) and rat (NRK-52E) and investigated the effect of U(VI) and Eu(III) as non-radioactive analog of trivalent actinides onto these cells. Furthermore, also the effect of the common DA HEDP (1-Hydroxyethylidene-1,1-diphosphonic acid; etidronic acid) and DTPA (diethylenetriamine-pentaacetic acid; penteteic acid) was studied.
In exposure experiments, cells were incubated with Eu(III), U(VI) or DA for 8h, 24h and 48h, respectively. Applied Eu(III) and U(VI) concentrations ranged from environmentally relevant trace concentrations up to millimolar solutions near the solubility limit. HEDP and DTPA were applied in the same concentration range, including recommended therapeutic dosages. The cell viability was measured using the XTT assay and dose response curves were determined for each exposure time and cell line. Microscopic investigations of cell morphology were performed to study possible alterations of exposed cells. In addition, ICP-MS analyses were conducted to determine Eu(III) and U(VI) solubility in the cell culture medium.
Cell viability studies reveal a concentration- and time-dependent effect on both cell lines for Eu(III) and U(VI) as well as for HEDP and DTPA. This enables the calculation of EC50 values from the dose response curves and comparison with literature values for other heavy metals and DA. Microscopic investigations reveal morphological alterations of the cells upon exposure. ICP-MS results indicate high solubility and, thus, high bioavailability of Eu(III) and U(VI) in cell culture medium.

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