SUBCELLULAR LOCALISATION OF RADIONUCLIDES BY TRANSMISSION ELECTRONIC MICROSCOPY IN AQUATIC AND TERRESTRIAL ORGANISMS

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The global framework of this study is to go further in the understanding of the involved mechanisms of uranium and selenium internalisation at the subcellular level and of their toxicity towards several aquatic and terrestrial organisms. In this context, the applications and performances of a Scanning Transmission Electron Microscope (TEM/STEM) equipped with CCD camera and Energy-Dispersive-X-Ray (EDAX) analysis are reported. The principal merit of this equipment is the clear expression of element distribution with nanometer resolution. The sample for TEM analysis were prepared in ultrathin sections of 70-140 nm (thickness) and those for EDAX in sections of 200-500 nm. This method offers the possibility of a direct correlation between histological image and distribution map of trace elements. For each sample, following TEM analysis, EDAX spectra or EDAX mapping were also recorded to confirm the identity of the electron dense material in the scanned sections.
Demonstration of the usefulness of this method to understand the bioaccumulation mechanisms and to study the effect of the pollutant uptake at the subcellular level was performed for target organs of a metal (U) and a metalloid (Se) in various biological models: a higher rooted plant (*Phaseolus vulgaris*)) and a freshwater invertebrate (*Orconectes Limosus*) and a unicellular green alga (*Chlamydomonas reinhardtii*)). TEM-EDAX analysis revealed the presence of U-deposits in gills and digestive gland in crayfish, and in vacuoles or in the cytoplasm of different rooted cells bean. In the alga, the accumulation of Se was found in electron-dense granules within cytoplasm associated with ultrastructural changes and starch accumulation.