

UPTAKE OF RADIOACTIVE METALS IN MARINE SENTINEL SPECIES:
A SPECTROSCOPIC STUDY OF SPECIATION AND BIOACCUMULATION MECHANISMS

Maria Rosa BECCIA

Université Côte d'Azur, CNRS, ICN, 06108 Nice, France

E-mail: maria-rosa.beccia@univ-cotedazur.fr

What happens when radioactive metals contaminate marine ecosystems?

The dual (chemical and radiological) toxicity of metallic radionuclides makes them more hazardous than other heavy metals and makes their management critical in case of release in the environment, where radionuclides persist for periods that depend on their isotopy (usually larger than the human-life time scale). As a result, marine organisms may be exposed to such elements, which may affect their bio-chemical processes.^[1,2] Traditional studies focusing on global accumulation rates are not sufficient to address the complexity of marine ecosystems, where chemical speciation and molecular mechanisms critically influence metal bioavailability and toxicity.^[3] To evaluate the broader bio-environmental impact of radioactive metals, a comprehensive molecular-level approach is essential.

This seminar will present the case study of uranium interaction with a laboratory-assembled marine ecosystem. We will discuss the uptake of uranium (^{nat}U) by the brown alga *Ascophyllum nodosum*, within a multi-scale mechanistic perspective (macroscopic, cellular and molecular scale).^[4] Particular focus will be put on the complementary analytical and spectroscopic tools used to explore the kinetics of ^{nat}U transfer fluxes from seawater to organisms, its distribution in tissues and cells and its *in vivo* chemical speciation.

[1] Reeves B., Beccia M. R., Jeanson A., Solari P. L., Siberchicot B., Berthomieu C., Marcellin D., Bremond N., Kerdikoshvili T., Michel H., Passeron Mangialajo L., Monfort M., Moulin C., Den Auwer C., *Environ Sci. Technol.* (2022), 56, 3462

[2] Stefanelli R., Beccia M. R., Solari P. L., Suhard D., Pagnotta S., Jeanson A., Mullot J. U., Vernier F., Moulin C., Monfort M., Aupiais J., Den Auwer C., (2024). *Env. Res.*, 252, 118877.

[3] Aupiais J., Beccia M.R., Monfort M., Den Auwer C., *Sci. Total Environ.* (2024), 935, 173247.

[4] Zerbini M., Solari P.L., Orange F., Jeanson A., Leblanc C., Den Auwer C., Beccia M.R., *Sci. Rep.* (2024), 14, 1021.