Transcriptomic studies of bacterial tolerance to uranium

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Microorganisms present in Deep Geological Disposal systems can compromise the isolation and stability of the residues by interacting with the stored radionuclides. Bentonite clay from Cabo de Gata (Almería, Spain) was selected as suitable backfilling material of future Spanish radioactive repositories, from which a new bacterial species, *Stenotrophomonas bentonitica* BII-R7, was isolated. Previous studies showed high tolerance of this bacterium to uranium (U) and its ability to remove it almost completely from the medium after 24 hours of incubation [1,2]. We used a variety of multidisciplinary techniques such as RNA-based Next Generation Sequency (NGS) (RNA-Seq) and microscopy, in order to characterize the mechanisms of U resistance used by this strain in presence of 100 and 250 µM of uranyl nitrate.

We found overexpression of several genes involved in heavy metal tolerance, as those involved in lipopolysaccharide biosynthesis or RND efflux transporters. Furthermore, we observed a high induction of different phosphatases in presence of both concentrations of the radionuclide. These results suggest a U(VI) biomineralization process, leading to precipitation of U-phosphate complexes via phosphatase activity, as it has been previously reported in other bacteria like *Caulobacter crescentus* [3], and reducing the bioavailability and toxicity of U in the environment. As a conclusion, these findings allow to consider this strain as a candidate for biorremediation strategies in environments contaminated with this radionuclide.

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