30/07 | 15h20
PARALLEL SESSION II - T1.P1 - ON THE CONTAMINATION OF FRESHWATER RESOURCES
Room 2.2.12 | Topic 1 - Environmental risks and health (4)

OC-032 - (EEF2019-13832) - OMICS REVEAL DISTINCT MECHANISMS OF TOXICITY OF NANOPARTICULATE AND IONIC SILVER IN MICROBES

Diana Barros (Portugal)[1,2]; Arunava Pradhan (India)[1,2]; Pedro M Santos (Portugal)[1,2]; Cláudia Pascoal (Portugal)[1,2]; Fernanda Cássio (Portugal)[1,2]

1 - Centre of Molecular and Environmental Biology (CBMA), Department of Biology, University of Minho;
2 - Institute of Science and Innovation for Bio-Sustainability (IB-S), University of Minho

The mechanisms of toxicity of silver nanoparticles (AgNPs) are not clear and the role of Ag+ released from the nanoparticulated form in the overall toxicity requires further attention, especially in aquatic ecosystems where NPs will most likely end up. The impacts of AgNPs and Ag+ were assessed based on the variations in the overall proteome in i) two aquatic fungal ecotypes of Articulospora tetracladia, one isolated from a non-polluted stream (At72) and the other from a metal-polluted stream (At61), and ii) the bacterial strain Pseudomonas sp. M1 (PsM1) isolated from a metal-polluted stream. Transcriptomic responses of At72 in the same exposure conditions were also assessed to complement knowledge from proteomic responses. At72 was the most sensitive to AgNPs, whereas PsM1 was the most tolerant one. The toxicity of AgNPs was supported by data from NP characterization, which showed increased particle stability and lesser agglomeration in presence of At72 that the other microbes. Omic responses to equitoxic levels of AgNPs and Ag+ suggested different mechanisms of toxicity since distinct profiles of protein and gene expression were unveiled. Gene Ontology (GO) enrichment analysis further unravelled several biological processes and allowed to differentiate the effects of AgNPs from those of Ag+. Overall, omic approaches revealed different adaptive responses to Ag+ or AgNPs in the metabolic, energetic and stress pathways. Furthermore, the negligible amount of Ag+ released from AgNPs suggested that toxicity of AgNPs was mainly associated with the particle form.