HOSTING GROUPS FOR INTERNATIONAL MOBILITY

Molecular Microbiology and BioNanotechnology Research Group

The research focuses on microbial interactions with toxic metal oxyanions – such as selenite, tellurite, arsenite, and arsenate – involving rare actinomycetes (*Micromonospora*, *Kitasatospora*), actinobacteria (*Rhodococcus*), and Gram-negative bacteria (*Stenotrophomonas*, *Ochrobactrum*, and *Pseudomonas*). Biological approaches are integrated with physico-chemical methods and statistical analyses to investigate microbial tolerance, adaptation, and responses to metal toxicity. The aim is to elucidate key processes in microbial cell adaptation, tolerance, resistance, and survival to toxic oxyanions, as well as to understand the biogenic synthesis of metal-based nanostructures (e.g., nanoparticles, nanorods, nanoplates) with potential biotechnological applications.

Additional studies address the physiological and genetic factors underpinning microbial degradation of toxic organic compounds, including naphthenic acids, alkanes, and per- and polyfluoroalkyl substances (PFAS), enhancing understanding of their role in pollutant bioremediation. Research also explores microorganism-material interactions, focusing on actinobacteria isolated from culturally significant artifacts. Their potential roles in both biodeterioration and conservation are assessed. Moreover, new antimicrobial materials – of natural or synthetic origin – are evaluated for effectiveness against microbial flora on artifacts, pathogenic strains, and antifouling with attention to their cellular mechanisms of action.

Team members:

Alessandro Presentato

Selected publications:

- *The actinomycete Kitasatospora sp. SeTe27, subjected to adaptive laboratory evolution (ALE) in the presence of selenite, varies its cellular morphology, redox stability, and tolerance to the toxic oxyanion.* ***Chemosphere****, 354, 141712, (2024) (http://doi.org/10.1016/j.chemosphere.2024.141712)*
- *Tolerance, adaptation, and cell response elicited by Micromonospora sp. facing tellurite toxicity: a biological and physical-chemical characterization.* ***Int J Mol Sci****, 23, 12631, (2022) (http://doi.org/10.3390/IJMS232012631)*
- *A combined physical–chemical and microbiological approach to unveil the fabrication, provenance, and state of conservation of the Kinkarakawa-gami art.* ***Sci Rep****, 10, 16072, (2020) (http://doi.org/10.1038/s41598-020-73226-6)*
- *Formulation of mesoporous silica nanoparticles for controlled release of antimicrobials for stone preventive conservation.* ***Front Chem****, 8, 699, (2020) (http://doi.org/10.3389/FCHEM.2020.00699)*
- *Aerobic growth of Rhodococcus aetherivorans BCP1 using selected naphthenic acids as the sole carbon and energy sources.* ***Front Microbiol****, 9, 672, (2018) (http://doi.org/10.3389/FMICB.2018.00672)*