Università degli Studi di Napoli Federico II

PhD in Biotechnology - 40th cycle

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Molecular strategies inspired by (hyper)thermophilic microorganisms to counter environmental pollution with biotechnological approaches

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Human activities have led to severe environmental pollution, mainly from the accumulation of heavy metals and the mismanagement of lignocellulosic biomass from agricultural and food industry waste. To address these issues, four strategies are proposed: the first one involves the development of protein-based biosensors using microbial metal-binding domains to detect Cd, As and Hg, leveraging microorganisms' resistance mechanisms; the second one focuses on bioremediation through the green synthesis of Zn NPs using thermophilic microorganisms. Due to their high surface area and small size which multiply the active sites for adsorption, various types of NPs have also been used for the removal of heavy metals from contaminated water [1]. The third strategy entails the isolation and characterization of novel heavy-metal-resistant microorganisms from contaminated environments to harness their resistance mechanisms for environmental applications. The fourth approach focuses on valorizing agri-food waste by using thermophilic CAZymes, especially GH, for an efficient conversion of lignocellulosic biomass into value-added products, supporting a circular bioeconomy [2][3].

References

[1] https://doi.org/10.1007/s10853-020-04415-x

[2] DOI: 10.1016/j.ijbiomac.2024.130550

[3] https://doi.org/10.3390/ijms24010243