

## **Biotransforming waste streams into biomolecules and biomaterials**

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Our consumption habits—from food to cosmetics, clothing, and various other products—urgently require a shift towards being more sustainable and environmentally friendly. Biotechnology emerges as a promising solution to address this pressing need. Microorganisms, though unseen to the naked eye, play a pivotal role in maintaining the health of our global ecosystem due to their abundance and diversity. They actively participate in crucial processes such as carbon and nutrient cycling, and contribute to human, animal, and plant health. Additionally, they serve as a valuable source of diverse products spanning industries like pharmaceuticals, chemicals, food, environmental management, and agriculture. Microorganisms can be turned into efficient factories for the production of various compounds and materials. Leveraging microbial capabilities, we can extract economic and environmental value through bio-upcycling, converting diverse waste streams into biomaterials (polyhydroxyalkanoates and bacterial nanocellulose), but also into next-generation, eco-friendly therapeutics. Focus is placed on bacterially derived natural products such as pyocyanin, prodigiosin, and actinomycin, which exhibit proven bioactivities like anticancer, antifungal, antibiofilm, and antiviral properties. Their greener production, processing and, formulation using innovative techniques such as fermentative bioprocess intensification, structural optimization via biocatalysis and formulations using metals, as well as biopolymeric drug carriers will be highlighted. In this way, harnessing the capabilities of microorganisms, we can effectively address both environmental and biomedical challenges, ushering in a new era of sustainability and innovation.