



# Bioremediation Strategies to Remove Toxic Chemicals and Metals from Various Effluent Solutions

Raghu Gogada<sup>1\*</sup>, Shanti Kumari Lunavat<sup>2</sup>, Jai Satya Gowri Gogada<sup>2</sup>, Surya Satyanarayana Singh<sup>2</sup>, Praveen Boddana<sup>3</sup>

<sup>1</sup>Department of Biochemistry and Plant Physiology, <sup>3</sup>Department of Plant Pathology, M.S. Swaminathan School of Agriculture, Centurion University of Technology and Management, Odisha, India.

<sup>2</sup>Department of Biochemistry, Collage of Science, Osmania University, Hyderabad, Telangana, India.

\*Correspondence Email: raghu.gogada@cutm.ac.in

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## Abstract

Bioremediation is defined as a spontaneous or managed process in which biological catalysis acts on pollutants and thereby decreases or eliminates environmental contamination. Bioremediation strategies fall into four broad categories: *in-situ*, composting, land farming and above-ground reactors. In most of the above cases microorganisms play a major role in the decontamination process. Microbes are known to have novel catabolic pathways, which are induced in response to specific chemicals when presented as sole carbon or nitrogen source. *In-situ* bioremediation relies on indigenous microflora present in soil and water bodies. By providing the limiting nutrients biotransformation's are enhanced several-fold (eg. Oil spills in sea). In composting a mixture of soil, decayed vegetable waste, manure and fertilizers are used for treatment of high concentrations of resistant chemical waste from industry (eg. DTT, TNT, PCB). Land farming is used to dispose of the oily sludge from petroleum refinery operations. The above-ground reactors are based on fermentation technology wherein microbial biofilms or pelletized/immobilized bio-sorbents are used in this process.

**Keywords:** Bioremediation, Toxic chemicals, Biopolymers, Environment

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Man has continually attempted to improve his living conditions resulting into over modernization, rapid industrialization, greedy cultivation and unlimited exploitation of every bit of natural resources. In recent years, the industrial developments and urbanization has led to the utilization of variety of synthetic chemicals in the form of pesticides, herbicides, plasticizers, dyes, detergents, drugs, petroleum products and industrial products such as lubricants, coolants, insulators, hydraulic fluids, solvents or synthetic wastes etc., which are released deliberately or accidentally into the environment. This has created a whole universe of new chemical compounds and is rapidly expanding its boundaries. The synthesis of useful chemicals ranging from pesticides to polymers

involve many toxic substances of public health and environmental concern which have become so common that the environment is being continuously contaminated by these toxic pollutants. Many of these chemicals and their transformation products are reported to be potentially toxic, teratogenic, mutagenic and carcinogenic to man and animals. If such chemicals are not degraded, they accumulate in the soil and cause serious environmental pollution and ecological changes. These environmental

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