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Discuss the application of microorganisms in the environment

Mining and Mineral Recovery.

The principles of microbial biogeochemistry (Ehrlich, 1981) and the potential for recovering mineral through improved microbial processes may be exploited within the next decade. Thiobacilli are autotrophic of sulfur compounds or ferrous iron. Techniques for manipulating the genes of this group of microorganisms to enhance leaching of copper and uranium are being developed (Yates et al., 1988). Although genetic technology as applied to this group of microbes is less advanced than that for other microorganisms, plasmids have been constructed that may enhance the recovery of gold from ores by *Thiobacillus ferrooxidans* and increase the organism's resistance to arsenic compounds (see Lindow et al., 1989, and reference therein).

Commercial bioleaching operations in the mining industry represent another application of microorganisms—treatment of ores in heaps or pits. Adverse environmental effects have not been reported from the introduction of improved bacterial strains for mining applications of biotechnology (Nicolaudes, 1987).

~~Waste~~ Waste Treatment

The most extensive and intensive application of microorganisms released into the environment is the domestic waste treatment, where they are used to reduce the biological oxygen demand and often to reduce the toxicity of sewage effluents. Sludge digesters, settling ponds, trickling filters, and enhanced degradation systems depend on microbial processes. Sewage sludge from large digesters, when pumped into an evaporation pond, represents a massive release of microorganisms into the environment. Yet effluent from a properly operated activated sludge processor or trickling filter poses neither public nor environmental health problems. The history of releasing treated sewage effluent into the environment argues convincingly that these procedures are safe.

Food Production

Naturally occurring microorganisms with specialized or unique properties have been used for centuries in food production. The basic microbiology of bread-making has remained substantially the same for thousands of years. Egyptian bakers as early as 2100 BC. Obtained their yeasts from the settlings of beer vats, whereas the Greeks and Romans used yeasts from wine vats, and later the English used brewer's yeast ("barm") (Ayres et al., 1980). Sourdough bread has been produced in the same francisco area for more than 100 years, with yeasts and a sourdough bacterium that ferments maltose (Ayres et al., 1980). Other fermentations are used in producing pickles, olives and sauerkraut. Virtually every human culture that utilized domesticated milk-producing animals also developed fermented milk products.

Bioremediation

Bioremediation the use of microorganism or microbial processes to degrade environmental contaminants, is among these new technologies. Bioremediation has numerous applications including clean-up of ground water, soils, lagoons, sludges and process-waste stream. Naturally occurring consortia frequently dominated by bacteria, have the capacity to degrade a wide spectrum of environmental pollutants. Consortia are responsible for the clean up of massive ~~waste~~ spills.

Microbial desulfurization of coal

Pollution from coal combustion is the most problem in the current use of coal of the biggest constraints on the increased use of coal. Both organic and inorganic sulfur contained in coal can be removed prior to combustion by physical, chemical and microbiological means the work on pyrite removal has been more extensive. Up to 90% removal of sulfur can be achieved.

Fungal removal of pitch in paper pulp manufacturing

Extractives from wood and other lignocellulose materials often referred to as wood resin, includes alkanes, fatty alcohols, fatty acids, resin acids, other terpenoids, conjugated, sterols

triglycerides and waxes - these lipophilic compounds cause the so-called pitch deposits along the pulp and paper manufacturing processes.

Pretreatment of the wood with fungi to degrade some of the wood extractives before pulping. Basidiomycete fungi, *Opitostoma* species are widely used for this purpose. When applied to wood chip piles, this fungus has been particularly effective in removing pitch forming compounds. Results of this application: 58% reduction in the pitch content of softwood with less than a 5% loss of woody mass. Of biotoxicity was reduced 11-14 fDd compared with untreated controls. White rot basidiomycete fungi are able to degrade the esters and waxes.