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LIGNINOLYTIC FUNGI: THEIR DEGRADATIVE POTENTIAL AND THE PROSPECT FOR THE DEVELOPMENT OF ENVIRONMENTALLY SIGNIFICANT BIOTECHNOLOGIES

Ligninolytic fungi are taxonomically heterogeneous higher fungi characterized by a unique ability to depolymerizee and mineralize lignin. They include *wood*-and *soil-inhabiting basidiomycetes* and some *ascomycetes*. The extracellular, non-specific, and oxidative enzymatic system of these fungi catalyses lignin degradation. This system includes lignin peroxidase, Mn-peroxidase, versatile peroxidase, and laccase, allowing the degradation of many persistent aromatic compounds with structures similar to those of the metabolites formed in the biosynthesis or degradation of lignin. Among such compounds are both individual substances [pesticides, polychlorinated biphenyls, halogenated aromatic compounds, nitro- and amino-substituted phenols, trinitrotoluene, synthetic dyes and Polycyclic Aromatic Hydrocarbons (PAHs)] and their complex mixtures.

Enzyme synthesis is not repressed when the concentrations of these substances are too low to induce the enzymes. Therefore, the enzymes can degrade even low concentrations of pollutants. The catalytic action of the Ligninolytic enzymes gives rise to polar and water-soluble products, which are more accessible for both fungal metabolism and further degradation by the natural soil micro flora.

On the basis of a screening of *basidiomycetes* and *ascomycetes*, we selected the most active fungi for their degradative activity toward PAHs, nonionic surfactants, alkyl phenols, synthetic dyes, and oil. These fungi were found to hold promise for further studies and use in biotechnology. Despite some differences, PAH degradation followed the same scheme, first forming quinone metabolites and later forming phthalic acid, which is included in basal metabolism. All the investigated *basidiomycetes* and the ascomycete *Cladosporium herbarum* completely decolorized anthraquinone dyes, and both the chromophore part of the molecule and the aromatic ring were available for degradation. The site of attack on oxyethylated alkylphenols (the oxyethyl chain or the aromatic ring) was shown to be determined by the fungal species. The fungi were able to metabolize oil under submerged cultivation and in soil. Pollutant degradation was accompanied by the production of ligninolytic enzymes and of emulsifiers, substances that promote pollutant solubility and affect enzyme catalytic activity. The unique properties of Ligninolytic fungi make them promising for use in bioremediation, particularly if pollutants are difficult to decompose by bacteria.

Biography

Natalia Pozdnyakova is a leading researcher at the Environmental Biotechnology Laboratory of the Institute of Biochemistry and Physiology of Plants and Microorganisms Russian Academy of Sciences. Her Main research area is Enzymology of the fungal degradation of lignin and xenobiotics.

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