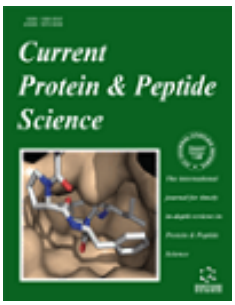

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Comparison of Laccases and Hemeproteins Systems in Bioremediation of Organic Pollutants

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Abstract

Aim: Laccases and peroxidases have attracted great interest for industrial and environmental applicat ions. These enzymes have a broad substrate range and a robust oxidizing ability. Moreover, using me diators or co-oxidants makes it possible to increase their catalytic activity and extend their substrate s cope to more resistant chemical structures. Background: Fungal laccases and ligninolytic peroxidase s, mainly lignin and manganese peroxidases, are the privileged oxidoreductases for bioremediation p rocesses. Nonetheless, an increasing diversity of laccases and peroxidase-type enzymes has been pro posed for environmental technologies. Objective: This article aims to provide an overview of these en zymes and compare their applicability in the degradation of organic pollutants. Methods: Fundament al properties of the proteins are covered and applications towards polycyclic aromatic hydrocarbons (PAHs) and pesticides are specially focused. Results: Laccases are multicopper oxidases initially studie d for applications in the pulp and paper industry but able to oxidize a variety of environmentally conc erning compounds. Relying on O_2, laccases do not require peroxides nor auxiliary agents, like Mn^{2+}, a lthough suitable redox mediators are needed to attack the more recalcitrant pollutants (e.g., PAHs). T rue and pseudo-peroxidases use a stronger oxidant (H_2O_2) and the redox chemistry at the heme site generates high potential species that allow the oxidation of dyes and some pesticides. Conclusion: La tely, research efforts have been directed to enzyme discovery, testing with micropollutants, and impr

oving biocatalysts' stability by immobilization and protein engineering. Further understanding of the effects of natural media components and solvents on the enzymes might lead to competitive enzyma tic treatments of highly toxic media.

Article Type: Review Article

Keyword(s): dye-decolorizing peroxidases; enzyme- mediator system; halogenated pesticides; Hemoglobin; horseradish peroxidase; lignin peroxidases; organophosphorus toxicants; versatile peroxidases

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