BACTERIAL ENZYMES FOR LIGNIN DEGRADATION: PRODUCTION OF AROMATIC CHEMICALS FROM LIGNOCELLULOSE

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The lignin content of lignocellulose and lignin-containing wastes represents a possible resource for production of aromatic chemicals, if efficient biocatalytic routes for lignin degradation can be found. The enzymology of fungal lignin degradation is well studied, but the enzymology of bacterial lignin degradation is much less well known. We have identified Dyp-type peroxidases DypB in *Rhodococcus jostii* RHA1 [1] and Dyp1B in *Pseudomonas fluorescens* [2] that are activated by Mn^{2+}, and show activity with lignin model compounds, with Kraft lignin, and with lignocellulose. From a strain of *Sphingobacterium sp.* T2 active for lignin oxidation, we have also discovered two extracellular manganese superoxide dismutase enzymes active for lignin oxidation, and a 1.35 Å crystal structure of MnSOD1 has been determined [3].

Current efforts are also focussed on pathway engineering in lignin-degrading hosts for bio-product formation. Deletion of the gene encoding vanillin dehydrogenase in *Rhodococcus jostii* RHA gives a mutant strain which, when grown on minimal media containing wheat straw lignocellulose, accumulates up to 96 mg/L of vanillin [4]. Re-routing of aromatic degradation pathways via insertion of genes encoding protocatechuate 2,3-dioxygenase (*praA*) or protocatechuate 4,5-dioxygenase (*ligAB*) into *R. jostii* RHA1 gives hosts that generate extradiol ring fission products that can be cyclised with ammonia to give pyridine-dicarboxylic acids, that are potential bio-replacements for terephthalic acid in bio-based polymers [5].

References

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