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**P8**

# NEW INSIGHT INTO FUNGAL DEGRADATION OF POLYCHLORINATED BIPHENYLS

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## Abstract

Polychlorinated biphenyls (PCBs) due to their persistency and toxicity represent a serious environmental problem. A high number of studies have been published about bacterial transformation of PCBs; however, PCB transport into the bacterial cells represents a limiting factor for their effective degradation. Moreover, probably the most important biphenyl-upper-pathway leads to production of chlorobenzoic acids (CBA) that represents dead-end toxic metabolites inhibiting further PCB transformation. On the other hand, information about fungal PCB degradation and the respective mechanisms is limited.

The aim of this study was to explore degrading capabilities of ligninolytic fungal representatives (LF) towards polychlorinated biphenyls under various physiological conditions. The degradation was tested in axenic cultures of the fungi in various liquid media that were artificially spiked with a technical mixture of Delor 103; however, also in a historically contaminated soil. An attention was also paid to elucidation of the degradation mechanisms performing degradation experiments with various isolated enzymes or sub-cellular fractions and to degradation of fungal PCB transformation products that were detected i.e. CBA. The degradation results were evaluated from many perspectives including analytical quantification, qualitative analysis of the transformation products, ecotoxicological monitoring and microbial population analyses. Generally, the results showed that the LF are very efficient in PCB removal when e.g. *Pleurotus ostreatus* 3004 degraded more than 90% of PCBs in low nitrogen-mineral liquid medium in 42 days and *Irpex lacteus* removed more than 75% of PCBs. The soil degradation experiment revealed that out of the most toxic PCB congeners, *Pleurotus ostreatus* and *Irpex lacteus* were able to remove 51% and 34% of PCBs, respectively. The CBA degradation experiments revealed that these typical bacterial PCB dead-end products are transformed by the fungi even more rapidly than the original compounds. On the other hand, the toxicity monitoring showed that after degradation of PCBs under model conditions, the acute toxicity increased in several cases. An attention was also paid to detection of PCB metabolites produced during the degradation using mainly mass spectrometry techniques, when hydroxyl and methoxyl PCB derivatives and further ring fission products were detected resulting in production of CBAs and related compounds, that were further transformed. The results suggest that both intracellular (P-450 monooxigenase, aryl-alcohol dehydrogenase, aryl-aldehyde dehydrogenase) and extracellular (ligninolytic) enzymatic systems are involved in the biotransformation of PCB by LF.

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