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"Gheorghe Asachi" Technical University of Iasi, Romania

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DEGRADATION OF ENDOCRINE DISRUPTING CHEMICALS AND REMOVAL OF ESTROGENIC ACTIVITY BY *LENTINUS TIGRINUS* AND ITS EXTRACELLULAR ENZYMES

S. Covino[1], T. Stella[2], Z. Křesinová[1], A. D'Annibale[2], M. Petruccioli[2], T. Cajthaml[1]

[1]Academy of Sciences of Czech Republic, Prague, Czech Republic; [2]University of Tuscia, Viterbo, Italy

Abstract

Endocrine disrupting compounds (EDCs) are environmental chemicals capable of interfering with natural hormones in human and wildlife endocrine systems. The heterogeneous family of EDCs comprises a wide range of substances (*i.e.* persistent organic pollutants (POPs), surfactants, plasticizers, estrogens and personal care products ingredients) which may cause adverse effects. Concerning the biodegradation of EDCs, it is of note that ligninolytic fungi and their extracellular enzymes exhibit a remarkable potential for the removal of these compounds. Therefore, the main objective of the present study was to investigate the degradation capacity of the basidiomycete *Lentinus tigrinus* towards four representative EDCs, *i.e.,* 17α-ethinylestradiol (EE2), bisphenol A (BPA), nonylphenol (NP) and triclosan (TRC). Whole-cell bioconversion experiments were conducted under both stationary and shaking conditions using two standard media, namely malt extract-glucose (MEG) and low-nitrogen Kirk's medium (LNKM). Fungal cultures were then spiked with either EE2, BPA, NP or TRC. Moreover, in order to evaluate the involvement of *L. tigrinus* lignin-modifying enzymes in the degradation process, *in vitro* treatments of the four EDCs were performed with purified laccase and MnP isoenzymes, under both mediated and non-mediated conditions. The outcome of *in vivo* and *in vitro* incubations was assessed also by determining the residual estrogenic activity of ethyl acetate-extracted reaction mixtures.

Regardless of the treatment typology, EE2, BPA and NP were effectively degraded by *L. tigrinus* cultures, and the processes were accompanied by the complete removal of the estrogenic activities associated to those culture extracts. Contrarily, TRC was more recalcitrant and it was not significantly degraded in shaken cultures conducted on LNKM. Accordingly, a high residual estrogenic activity was found in ethyl acetate extracts of the latter samples. As for the enzymatic treatments, laccase was more efficient than MnP in the oxidation of EE2 and BPA under non-mediated conditions, while MnP oxidized NP and TRC at a faster rate than the former. In mediated reactions, best degradation performances towards EE2, BPA and TRC were observed with the laccase/mediator system while NP was more susceptible to MnP oxidation. The estrogenic activities of EE2 and BPA were significantly removed by all *in vitro* treatments and their removal extents were not significantly affected by the type of treatment. A high impact of the treatment typology, conversely, was observed for NP and TRC, the residual estrogenic activities of which were best removed by the laccase and laccase/mediator systems.

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