Isolation and characterization of *Fusarium solani:* a novel Bisphenol A degrading fungus

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1. Introduction – Bisphenol A (BPA) is high risk environmental contaminant due to its ability to mimic estrogenic hormones and affect the endocrine signalisation. A lot of work has been done in the field of BPA biodegradation, but only a handful of publications focus on degradation by fungi [1]. Aim of our work was to isolate new microbial strains capable of BPA biodegradation from heavily polluted sites in China. We have focused on biodegradation in environment relevant conditions (low carbon content, presence of humic acids and heavy metal contamination).

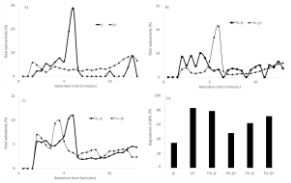

Image 1. A-C: HPLC-LSC chromatograms of degradation products in different treatments. D: Comparison of degradation efficiency.

2. Experimental – Degradation of initial 200 ppm of BPA that was spiked with 100 kBq of ^{14}C-labeled BPA was performed in different treatments (with (g+) or without (g-) added glucose (0,1%) in presence of humic acids (Hu) and in presence of 50mM copper ions (Cu) in triplicates). Degradation was monitored using light scintillation counting (LSC). Degradation products were analysed using HPLC-LSC and HPLC-MS. Fate of BPA was monitored by LSC in media, wash from cells, inside of cells and in case of Hu treatment bound to Hu.

3. Results and Discussion – Based on growth properties using BPA as sole carbon source we have selected fungal strain, that has been identified by sequencing and comparing sequences of DNA sequences coding rDNA ITS4 region as a strain of *Fusarium solani* (accession number KT224788.1). Different conditions had effect on rate of degradation, as can be seen on chromatograms after 24 days of degradation on image 1 A-C. Degradation was most efficient in treatments with added glucose. Cu^{2+} contamination didn't have significant effect on degradation efficiency (image 1D). Presence of copper ions had effect on BPA transfer into cells, as can be seen on image 2 showing fate of BPA after 24 days of degradation. Main product of degradation was identified as dimethoxy BPA and by analysis of extracellular enzyme activity and literature search [2] is was suggested, that degradation was performed inside of the cells using oxidation by cytochrome P450 and intracellular methylation and not by extracellular enzymes, as has been described in most of the publications focusing on degradation of BPA by fungi [3].

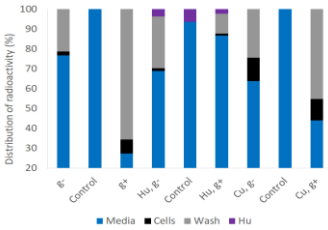

Image 2. Fate of BPA in all treatmens.

4. Conclusions – Novel BPA degrading fungi was isolated from heavily contaminated sites in China and was identified as *Fusarium solani*. It has been able to degrade 62% of initial BPA in unfavourable conditions and 83% in glucose enriched conditions. Instead of expected role of extracellular ligninolytic enzymes, mitochondrial oxidation and intracellular methylation were identified as main degradation mechanisms.

5. References

[1] R. Mtiba, *Ecotox Environ Safe*, **156**, 2018.
[2] Wang et al., *Chemosphere*, **93,** 2013.
[3] H. A. Erkhurt, *Clean-Soil Air Water*, **43**, 2015.