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Title: Biodegradation of Carbamazepine by the bacterial strain Labrys portucalensis F11 – metabolism and toxicologic studies

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Background

Occurrence of pharmaceuticals in the environment is a topic of concern. Most pharmaceuticals are not completely mineralized and are released on the sewage systems through excretion and by improper elimination and disposal(1). Municipal wastewater treatment plants (WWTPs) are not designed to remove them and they are released into the environment(2). They are classified as persistent microcontaminants due to their continuous release even if at low concentrations (3). Carbamazepine (CBZ) is an widely used anticonvulsant and has been suggested as a molecular marker of contamination in surface water and groundwater(4).

Method

Biodegradation of CBZ by the bacterial strain *Labrys portucalensis* F11 was tested as sole carbon and energy source (0.04 mM) and in the presence of acetate as primary carbon source. Transformation products (TPs) were detected and identified by UPLCQTOF/MS/MS. Ecotoxicologiacl effects of CBZ and the TPs resultant from biodegradation were evaluated at different trophic levels, i) zooplanckton (*Dapnhia magna*) and ii) plants (*Lipidium sativum*). The 24–48 h immobilization of *D. magna* bioassays were performed following the Standard Operational Procedures of Daphtoxkit F™. The toxicity was measured as the immobilization of *D. magna* according to the procedures OCED Guideline 202(5). The bioassay with *L. sativum* evaluated the potential toxicity considering the root elongation according to OECD Guideline 208(6).

Results & Conclusions

Strain F11 was able to degrade 95% of initial CBZ concentration during 30 days experiment. Supplementation with acetate increased degradation to 100% in 24 days. A group of 12 TPs formed in the microbial process were identified; CBZ degradation by strain F11 proceeds mainly by oxidation, hydroxilation and cleavage of the aromatic ring. The effect of whole biodegradation products on root elongation of *L. sativum* was practically neglectable; however the same exhibited toxicity to *D. magna*. Strain *Labrys portucalensis* F11 proved to be able to degrade CBZ and may be potentially useful for biotechnological applications.

References & Acknowledgments

References:

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3) http://dx.doi.org/10.1016/j.chemosphere.2014.01.014

4) http://dx.doi.org/10.1007/s11356-013-2428-9

5) http://dx.doi.org/10.1787/9789264069947-en

6) http://dx.doi.org/10.1787/9789264069947-en

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