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# Biodegradation of Carbamazepine and Diclofenac by Bacterial Strain Labrys Portucalensis

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**Abstract :** The occurrence of pharmaceuticals in the environment has been a topic of increasing concern. Pharmaceuticals are not completely mineralized in the human body and are released on the sewage systems as the pharmaceutical itself and as their “biologically active” metabolites through excretion, as well as by improper elimination and disposal. Conventional wastewater treatment plants (WWTPs) are not designed to remove these emerging pollutants and they are thus released into the environment. The antiepileptic drug carbamazepine (CBZ) and the non-steroidal anti-inflammatory diclofenac (DCF) are two widely used pharmaceuticals, frequently detected in water bodies, including rivers and groundwater, in concentrations ranging from ng L 1 to mg L 1. These two compounds were classified as medium to high-risk pollutants in WWTP effluents and surface waters. Also, CBZ has been suggested as a molecular marker of wastewater contamination in surface water and groundwater and the European Union included DCF in the watch list of substances Directive to be monitored. In the present study, biodegradation of CBZ and DCF by the bacterial strain Labrys portucalensis F11, a strain able to degrade other pharmaceutical compounds, was assessed; tests were performed with F11 as single carbon and energy source, as well as in presence of 5.9mM of sodium acetate. In assays supplemented with 2.0 and 4.0 µM of CBZ, the compound was no longer detected in the bulk medium after 24hr and 5days, respectively. Complete degradation was achieved in 21 days for 11.0 µM and in 23 days for 21.0 µM. For the highest concentration tested (43.0 µM), 95% of degradation was achieved in 30days. Supplementation with acetate increased the degradation rate of CBZ, for all tested concentrations. In the case of DCF, when supplemented as a single carbon source, approximately 70% of DCF (1.7, 3.3, 8.4, 17.5 and 34.0 µM) was degraded in 30days. Complete degradation was achieved in the presence of acetate for all tested concentrations, at higher degradation rates. The detection of intermediates produced during DCF biodegradation was performed by UPLC-QTOF/MS/MS, which allowed the identification of a range of metabolites. Stoichiometric liberation of chorine occurred and no metabolites were detected at the end of the biodegradation assays suggesting a complete mineralization of DCF. Strain Labrys portucalensis F11 proved to be able to degrade these two top priority environmental contaminants and may be potentially useful for biotechnological applications/environment remediation.

**Keywords :** biodegradation, carbamazepine, diclofenac, pharmaceuticals
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