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Abstract

Metabolic Activity of *Chlamydomonas reinhardtii* Cells under Diclofenac-Induced Stress †

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Abstract: Non-steroidal anti-inflammatory drugs (NSAIDs), such as diclofenac (DCF), are detected in water bodies all over the world. Their presence in water environments pose a serious threat to non-target plant organisms, including unicellular green algae. To survive in the contaminated environments, these organisms need to modify their metabolism to be able to cope with NSAID-induced stress. Knowledge of the algal response to drugs is crucial for environmental protection. In the present work, we report the response of the unicellular green alga, *Chlamydomonas reinhardtii*, to DCF applied at a concentration of 32.7 mg/L, corresponding to toxicological parameter EC10. The algae's susceptibility to DCF was estimated based on the physiological parameters: population growth, oxidative stress symptoms, and photosynthetic activity. Moreover, the cell cultures were analyzed for the appearance of diclofenac transformation products. We found that DCF caused a slight decrease in the population growth rate and photosynthetic activity (quantum yield of photosynthesis) of the cells. Furthermore, some symptoms of oxidative stress (singlet oxygen overproduction) were observed. However, in the biomass and culture media, a wide range of DCF metabolites was discovered. This suggests that in the presence of relatively low concentrations of DCF, the biochemical activity of the algae was efficient enough to metabolize a part of the drug in the medium. Notably, some of the analyzed transformation products were similar to those formed during the metabolism of DCF by bacteria, while others were characteristic of eucaryotic metabolic pathways. In conclusion, *C. reinhardtii* exposed to DCF can keep its metabolic activity at a level sufficient for survival and biotransformation of the drug. Our results give rise to the assumption that other algae strains may also have the potential to metabolize DCF, thus contributing to the remediation of environments contaminated with pharmaceuticals.

Keywords: non-steroidal anti-inflammatory drugs; diclofenac; *Chlamydomonas reinhardtii*; metabolism

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