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Abstract

Metabolic activity of *Chlamydomonas reinhardtii* cells under diclofenac-induced stress †

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Abstract: The non-steroidal anti-inflammatory drugs (NSAIDs), such as diclofenac (DCF), are detected in water bodies all over the World. Their presence in the water environment poses a serious threat to non-target plant organisms, including unicellular green algae. To survive in the contaminated environment, these organisms need to modify their metabolism to be able to cope with NSAIDs-induced stress. Knowledge of algal response to drugs is crucial for environmental protection.

In the present work, we report the response of unicellular green alga *Chlamydomonas reinhardtii* to DCF applied in the concentration 32.7 mg/L, corresponding to toxicological parameter EC10. The algae susceptibility for DCF was estimated based on physiological parameters: population growth, oxidative stress symptoms, and photosynthetic activity. Moreover, the cells' cultures were analyzed for the appearance of diclofenac transformation products.

We have found that DCF caused a slight decrease in the population growth rate and photosynthetic activity (quantum yield of photosynthesis) of the cells. Further, some symptoms of oxidative stress (singlet oxygen overproduction) were observed. However, in the biomass and culture media wide range metabolites of DCF were discovered. This suggests, that in the presence of relatively low concentration of DCF biochemical activity of the algae was efficient enough to metabolize a part of the drug in the medium. What is important, some of the analyzed transformation products were similar to those formed during the metabolism of DCF by bacteria, while other were characteristic for eucaryotic metabolic pathways.

In conclusion, *C. reinhardtii* exposed to DCF can keep its metabolic activity on the level sufficient for surviving and for biotransformation of the drug. Our results give rise to the assumption that other algae strains may also have potential to metabolize DCF thus contributing to the remediation of the environment contaminated with pharmaceuticals.

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