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Various effects of non-steroid anti-inflammatory drugs (NSAIDs) on the growths of cyanobacteria and eukaryotic algae

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In recent years measureable concentrations of non-steroid anti-inflammatory drugs (NSAIDs) have been shown in the aquatic environment as a result of increasing pharmaceutical-consumption of the human population. Effects of five often used non-steroid anti-inflammatory drugs (diclofenac, diflunisal, ibuprofen, mefenamic acid and piroxicam) on growth of cyanobacteria (*Synechococcus elongatus*, *Microcystis aeruginosa*) and eukaryotic algae (*Desmodesmus communis*, *Dunaliella salina*, *Haematococcus pluvialis* and *Cryptomonas ovata*) and changes in their concentration were investigated in laboratory experiments.

According to the changes of growth parameters (optical density at 800 nm and chlorophyll-a content), cyanobacteria seemed to be more tolerant to NSAIDs, than eukaryotic algae. Although growths of eukaryotic algae were reduced during all treatments, mefenamic acid was far the most toxic to all studied algal species. The cryptomonad was the most sensitive to the treatments, while the flagellated green algae were more sensitive compared to the non-motile *Desmodesmus* species.

Only the concentrations of diclofenac, diflunisal and piroxicam decreased compared to the initial concentration during exposure, so there were no clear correlations between uptake/degradation and toxicity, especially taking into consideration that mefenamic acid was the most toxic but its concentration did not change in treated cultures. Molecules characterized by essentially similar mode of action behaved in a very heterogeneous manner in inhibition of algal growth. Nevertheless, the results highlight the fact that the studied NSAIDs affect the producer microorganisms in particular algae (cryptomonads, flagellated green algae) which play an important role in the food chain, such as food for zooplankton, so these chemicals can have relevant environmental impacts.