

Mechanisms of Pharmaceutical and Personal Care Product Removal in Algae-Based Wastewater Treatment

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The widespread distribution of pharmaceuticals and personal care products (PPCPs), in particular in the built environment, has led to increased concern about their potential to affect both human and ecosystem health. In this research, we investigated the role of algae species *Scenedesmus obliquus* and *Chlorella vulgaris* in governing PPCP transfer and transformation mechanisms in algae-containing environments. Lab-scale algal bioreactors were created under various conditions of light, water matrix, and sterilization method to isolate and elucidate reaction mechanisms affecting carbamazepine, ibuprofen, gemfibrozil, and triclosan. The parent compounds and their potential transformation products were analyzed in both the water and algae phases. The results showed that ibuprofen was primarily biotransformed thanks to synergistic relationships between the algae and the bacteria. Ibuprofen biotransformation products such as hydroxy-ibuprofen, carboxy-ibuprofen, and 4-isobutylcatechol were detected in several samples. In all the reactors exposed to light, triclosan underwent both phototransformation and biotransformation. Triclosan biotransformation took place in *Scenedesmus obliquus*, as demonstrated by the presence of triclosan-O-sulfate in the algae extracts. No evidence of significant carbamazepine and gemfibrozil transfer or transformation was observed under the experimental conditions tested. These results suggest that microalgal-bacterial consortia can facilitate PPCP transformation in algae-based passive water treatment systems.