Title:

Biological Removal of Endocrine Disrupting Compounds from Wastewater using Microalgal-Bacterial Consortia.

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Abstract:

Growing population, urbanization and industrialization has resulted in significant contamination of water streams with a variety of endocrine-disrupting chemicals (EDCs). To date, conventional and advanced wastewater treatment plants are not designed or regulated to remove EDCs completely, and therefore they end up in wastewater effluents which are then discharged directly into the environment. These are bioactive, ubiquitous, toxic and persistent compounds; therefore, it is extremely important to investigate and study organisms that can degrade them.

This work focuses on assessing the feasibility and efficiency of microalgae-bacteria consortia in the removal of endocrine disrupting activity in municipal wastewater caused by hormones, pharmaceuticals and personal care products (E1, E2, EE2, EE3, Diclofenac and Caffeine). Wastewater (WW) and activated sludge (AS) were collected from the plant located in Tisa', Czech Republic, which receives mainly municipal and agricultural influents. Three microalgal strains known for their EDCs removal efficiency, ease of culturing and high tolerance to variable environmental conditions (*Chlorella vulgaris*, *Scenedesmus obliquus* and *Selenatrum capricornutum* -single and mixed cultures), were selected and subjected to an acclimation process to WW to improve their tolerance and biodegradable capacity of contaminants at realistic concentrations. Algal growth was monitored by means of optical density (OD) and the presence of algae in the culture routinely monitored by microscopic examination. For bacteria enrichment and isolation, the AS was subjected to serial dilutions and plated on agar plates containing M9 minimal medium and the EDCs mixture (1mg/L each) as their sole carbon source, and incubated in the dark at 37°C. After two weeks colonies were observed as white and creamy, with circular shape and entire margins. Gram-staining identified the isolated bacteria as rod-shaped and Gram-negative. Algae and the isolated bacteria will be used in future work to build a consortium to evaluate the EDCs removal efficiency under the influence of algae:bacteria ratio, inoculation timing, pH and temperature, and for all combinations, to screen the best candidates and best performance working parameters. The stability of the consortium after several treatment cycles will also be investigated. This approach would constitute the first step towards the application of the ecological engineering concept to microalgal remediation processes, resulting in the development of more resilient and effective treatment systems.