Estimation of susceptibility and remediation potential of green algae towards non-steroidal anti-inflammatory drugs detected in aquatic environment

Pharmaceuticals and their metabolites are ubiquitous contaminants of the environment. They belong to "contaminants of emerging concern", defined as chemicals that show some potential to pose risk to the environment and which are not yet subjected to regulatory criteria or norms for the protection of the environment. The environmental risk results from the fact that pharmaceuticals, designed to have a specific beneficial mode of action in humans or animals, could also have a significant effect on non-target organisms.

Among different classes of pharmaceuticals, a lot of attention is paid to nonsteroidal anti-inflammatory drugs (NSAIDs). Increasing contamination of the environment with NSAIDs is caused by their intensive input from medical, veterinary and household sewage or landfills as well as by their inefficient removal in "standard" wastewater treatment plants. In order to find efficient methods of NSAIDs removal, scientists turned their attention to biological treatments of the contaminated water, with a special focus on remediation systems based on plants and algae.

The main aim of the project is to estimate the usefulness of green algae strains for removal of NSAIDs from the natural water bodies and wastewaters. First, susceptibility of the strains to four of the most common pharmaceutical-contaminants, diclofenac, ibuprofen, naproxen and ketoprofen, will be examined in detail, including standard toxicological endpoints (ECs, based on inhibition of population growth) as well as biochemical and physiological parameters (e.g. photosynthetic and respiratory activity). Next, cells ability to adsorption, bioaccumulation and biotransformation of the pharmaceuticals will be analyzed. Three algal species were chosen for investigation: (1) *Chlamydomonas reinhardtii*, a model organism in physiological, molecular and toxicological studies, (2) *Desmodesmus armatus*, regarded to be tolerant to environmental contaminants and (3) *Chlorella vulgaris*, widely used in "green technology" applications.

The selected strains differ in their particular features, like cellular volume/mass ratio, cell wall architecture or antioxidative enzymes activity. Therefore, we hypothesize that their susceptibility and remediation potential to NSAIDs could be different. The project assumes that detailed examination of algae response to drugs on biochemical and physiological level, combined with analysis of their remediation potential, will give a scientific basis for further investigations of practical application of the selected green algae in wastewater treatment. After completion of the project, its results will be used for preparation of the application grant proposal, aimed at the practical use of knowledge acquired during research, in cooperation with industrial sector related to sewage treatment.