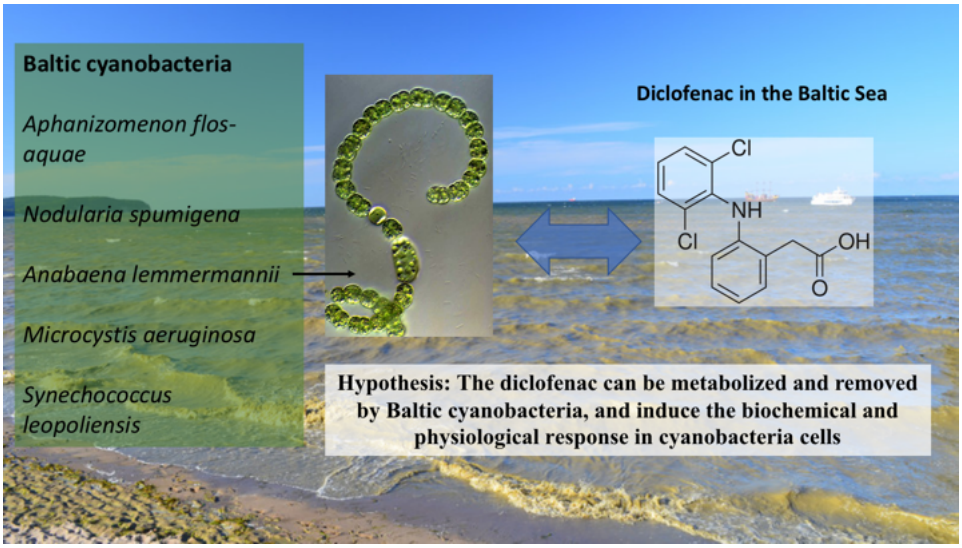
Project: Study of biochemical and physiological markers of the diclofenac effect on Baltic cyanobacteria

The presence of the pharmaceuticals in the environment is an emerging issue. There are the chemical compound which are intended to be biologically active, and after introduction to the environment its effect are still observed. There is a poor knowledge of its effect into real environment, where the concentrations are lower than those used in laboratory tests, what more they are in mixture with other. In the standard ecotoxicological researches the effective doses of pharmaceuticals are determined in acute test with a specified endpoints. Phytoplankton should have a special attention, while it is the primary producers in water environment. In a case of phytoplankton, the endpoint of ecotoxicological studies is the reducing of the scope of the grow of culture. Such parameter state about the toxic effect, but it have does reflect of the changes inside the organism and the population condition. The phytoplankton is a diverse group of water organism, in which diatoms, green algae and cyanobacteria can be found. The impact of pharmaceuticals into phytoplankton was mainly tested using green algae, while the single studies were focused on cyanobacteria. Most of the report present the EC50 (concentration of chemical that gives half-maximal response) values, while the biochemical and physiochemical changes are rarely tested. The researches on the possibilities of the biodegradation of the pharmaceuticals by the phytoplankton are missed, despite the several reports on the great removal potential of selected pharmaceutical from wastewater by microalgae consortia.

The cyanobacteria widely occur in Baltic Sea, and forming a problematic blooms during summer period. They are also in chronic exposure to the pharmaceuticals, for example diclofenac. This representative of the painkillers is the emerging pollutant due to its difficult removal by wastewater treatment and negative impact found in laboratory studies for variety of organisms. The impact of diclofenac into the cyanobacteria occurred in Baltic Sea was never presented, despite some literatures evidence of higher resistance of cyanobacteria to pharmaceuticals compared to the green algae. Thereby the main research hypothesis of the project is that **diclofenac can be metabolized and removed by the Baltic cyanobacteria, what induce the biochemical response in cyanobacteria cells.**



In the presented project, despite the EC50 determination for such cyanobacteria species like *Nodularia spumigena*, *Synechocystis salina* and *Microcystis aeruginosa*, the biochemical and physiochemical markers of diclofenac are planned to be tested on the level EC50 and lower environmental concentrations. Such parameters are planned to be tested: change into secondary metabolites production (volatile chemicals, peptides, toxins), pigments, oxidative stress, effects on photosynthetic and respiratory parameters, and the enzymes used in the second phase of metabolism (for example glutathione-S-transferase). In addition, the specialist in the analytical chemistry will be determined the metabolites of diclofenac produced by the tested species. To be more close to the environmental situation, cyanobacteria together with symbiotic bacteria are planned to be tested. Finally, the statement of the toxicity and removal potential of diclofenac by Baltic cyanobacteria will be elaborated, and the diclofenac impact into blooms forming presented. For the purpose of the project, the cooperation of the specialist from a field of analytical environmental chemistry, phytophysiology, microbiology and marine biology with an experience in phytoplankton analysis were initiated.