Metabolites of Baltic cyanobacteria as natural compound library for high throughput screening and the development of new antiviral drugs

Key words: Baltic cyanobacteria, antiviral agents, flaviviruses, coronaviruses

Despite significant progress in medicine, infectious diseases still constitute a major threat to public health and belong to the leading causes of death. Currently, the list of antiviral drugs is limited to only 90 substances, and still there is no cure for more than 200 viral infections. While recurring epidemics of such infectious as measles or chickenpox may pose a threat to public health, the real danger lies in new pathogens that cross borders or/and are transmitted from animals and rapidly spread in the human population.
Within this project, the development of new antiviral agents active against coronavirus and flaviviruses is initiated. These viruses pose a major threat, due to the unpredictability of their prevalence and infectious properties. A development of new antivirals is essential to control the existing threats, but also to protect the population in the case of emergence of yet unknown viral variants. In the work, cyanobacterial metabolites as ultra-rich libraries of biologically active compounds will be explored. In preliminary tests, we revealed that extracts from Baltic cyanobacteria constitute a promising source of compounds active against flaviviruses and coronaviruses. The positive results encouraged us to plan more detailed studies with the aim to discover new cyanobacterial antiviral agents (**CAAs**) and identify their mechanisms of action. To achieve the goals of the project, the following tasks will be implemented: (1) isolation and identification of new antiviral compounds from cultures of Baltic cyanobacteria; (2) construction of CAAs library; (3) determination of CAAs mechanisms of action and (4) assessment of the effects on other targets.
We think that planning a synthesis of CAA within this project, without any knowledge about the structure of the compound, would not be feasible. Consequently, the work will have to be based only on natural sources of the CAAs – which is a limiting factor. However, the library of CAAs (compounds and the repository), the results of all performed bioassays and analyses, as well as the data from genome mining – as an outcome of the project – will pave the way for successful drug development in further studies. They should include QSAR (quantitative structure-activity relationship) and optimization of CAA pharmacological properties, development of the most effective method of CCA synthesis, ADME (adsorption, distribution, metabolism, excretion), toxicological tests on animal models and other experiments usually preceding clinical test.