Harmful water blooms have been observed worldwide for many years as a major global problem of eutrophication. Cyanobacteria are prokaryotic oxygenic phototrophs constitute a major component of water blooms. Cosmopolitan range of cyanobacterial blooms, their diversity and the ability to produce toxins with a broad spectrum of activity (such as: microcystins MSc and cylindrospermopsin CYN – hepatotoxins, and anatoxin-ANTX-A - neurotoxin) causes that scientists around the world are trying to develop effective methods for reducing the occurrence of cyanobacterial blooms. Therefore, at the present time it is not enough to monitor the mentioned problem but it requires elaboration of new solutions in order to reduce the threats related to the occurrence of harmful cyanobacterial blooms. Understanding the relationships between cyanobacteria and other organisms and processes regulating this interactions is very important. Among others, **very needed is knowledge on bacteria inhibiting growth or lyse of cyanobacterial cells, it means algicidal bacteria - AB. Since AB activity is usually associated with the breakdown of cyanobacterial cells, as a consequence, a large amount of cyanotoxins may be released into the water, therefore, it is necessary to check whether the above mentioned bacteria also have the simultaneous ability to degrade cyanobacterial toxins.** The proposed project will implement the following objectives: **1.** Isolation and selection of planktonic strains of algicidal bacteria and analyzing their impact on cyanobacteria and green algae cultures; **2.** Checking the specificity of algicidal bacteria studied against different genera/species of cyanobacteria including toxigenic and non-toxic strains and algae representatives; **3.** Taxonomic characterization of isolated algicidal bacteria on the basis of morphological and genetic approach; **4.** Characterization of morphological, biochemical and genetic changes in cyanobacterial cells exposed to different algicidal bacteria; **5.** Evaluation of the possibility of degradation of three types of cyanotoxins (microcystins - MCs, cylindrospermopsin - CYN and anatoxin-a - ANTX-a) by selected bacteria; **6.** Identification of algicidal compounds produced by bacteria studied; **7.** Evaluation of the sensitivity of cyanobacterial cells to selected compounds produced by the tested algicidal bacteria as a single agent and as a group of compounds.

To carry out the research, material from lakes and reservoirs will be taken (the region of Central Poland and Wielkopolska), where water blooms with *Microcystis*, *Planktothrix*, *Aphanizomenon* or *Raphidiopsis* are observed every year. Water will be collected to isolate pelagic bacteria with algicidal properties (AB). Then, in laboratory conditions, the effect of algicidal isolates on the growth and damage of cyanobacterial cells (strains representing the above mentioned genera cyanobacteria) and green algae (representing by *Desmodesmus* and *Pseudopediastrum*) will be determined. The use of cyanobacteria or green algae will enable to check whether isolated AB are specific for one of the tested cyanobacteria strains (prokaryote) or their range of influence is wider and include the representative of algae – green algae (eukaryote). Taxonomic description of AB will be done. The cell response of cyanobacteria to AB will be examined by estimating the expression of selected genes for the evaluation of: the activity of photosynthetic apparatus, the possibility of cyanobacterial DNA damage and the potential for MCs production. The possibility of producing ROS and the presence of the products of oxidative lipid degradation will be assessed, also. The next task will be to check if AB can simultaneously degrade cyanotoxins: MCs, CYN or ANTX. Finally, an attempt will be made to confirm the presence of known algicidal compounds and to identify new compounds with this effect (material obtained from the AB studied). With this would also assess the possibility of toxic effects of selected algicidal compounds or group of such compounds on the cyanobacterial cells in the context of the additive or synergistic effect.

Proposed **hydrobiological/microbiological studies (with application of microscopic, genetic, biochemical and analytical methods) will fill the gap in the research related to interactions between AB, with the simultaneous possibility of degradation of cyanotoxins, and freshwater cyanobacteria occurring in temperate climate zone.** Better understanding of interactions between AB and toxic cyanobacteria is necessary to invent new biotechnological approaches useful in aquatic ecosystem protection and during implementation of recultivation methods.