Description for the general public

Constantly growing worldwide industrial production contributes to the formation of huge amounts of toxic chemical waste, including phenolic compounds, which after entering the environment may be a serious threat to the ecosystem. Therefore, there is a need for effective treatment of these pollutants. Biological methods based on the degradation of contaminants by microorganisms are currently the most frequently used solution of this problem. Nowadays, wastewater from industrial production are treated together with domestic ones. As a result, sewage treatment plants are commonly exposed to high concentration of phenolic compounds that are very toxic and resistant to degradation. This phenomenon may lead to the impairment or even inhibition of biodegradation of xenobiotics and thus may significantly, negatively affect the physiological state of activated sludge and wastewater treatment plant. As a result, the contamination of the surrounding environment may occur. Problems with the treatment of phenolic wastewater can also be connected with various composition of these sewage, including the presence of heavy metals, sulfur compounds, cyanides and ammonia. For this reason, bioaugmentation seems to be a promising method for cleaning up the environments contaminated with mixtures of such compounds. However, application of this technique to improve the activated sludge system is not widely applied in a full scale wastewater processing. The main reason of its failure is an unpredictable fate of the microorganisms inoculated into activated sludge or loss their degradative capabilities. Introduced bacteria, despite of their high degradation potential, are often being washed out from the system, due to the lack of abilities to incorporate into activated sludge flocs. Before selection of microorganisms for their potential use in bioaugmentation many aspects have to be considered. When activated sludge bioaugmentation process is planned, not only the high microbial degradation potential of various aromatic xenobiotics should be taken into consideration, but also the resistance of bacteria to heavy metals and primarily all of the features enabling the incorporation and survival of selected strains in this ecosystem. Study of these capabilities as well as the mutual interactions between inoculants and microorganisms naturally existing in the activated sludge is a main assumption of this project. Finally, the key metabolic features of allochthonous bacteria enabling their survival and activity in the activated sludge will be indicated, the composition of highly effective bacterial consortium will be developed as well as the effectiveness of bioaugmentation will be evaluated.