

DESCRIPTION FOR THE GENERAL PUBLIC

Azole antifungal agents - biodegradation and impact on environmental microorganisms

Biologically active chemical compounds pose a serious pollution of natural environment. Most of all, this problem affects industrialized countries with a high level of economic development. To a large extent, the contamination concerns over-the-counter pharmaceuticals, personal care products or biocides, which are sold in large difficult to estimate amounts. These substances are often introduced to surface waters as a result of improper disposal. What is important, pharmaceuticals, as well as pesticides generally belong to endocrine disrupting compounds. Their presence in relative high concentrations in groundwaters, surface water or wastewater is harmful for humans and animals. The active ingredients of the compounds in question are azole antifungal agents. Their most common representative is clotrimazole.

Being introduced to the environment, chemical compounds can undergo the biodegradation – biological decomposition by microorganisms using them a sole source of carbon and energy. However, in the case of synthetic compounds, which do not occur in the environment naturally, this process is often impeded. The above mentioned, environmental contamination by azole antifungal agents arises the questions about the environmental fate of these compounds and their interactions with microorganisms capable of degrading such group of chemicals.

The scientific objective of the project is to examine the biodegradation of antifungal azole derivatives by environmental bacterial strains. Moreover, to the project objectives belongs also the analysis of the impact of azole derivatives on metabolic activity of bacterial cells as well as evaluation of their effect on cell surface properties of environmental microbial strains.

In order to acquire the answer to the research objectives, three main research tasks were planned in detail. During the first step of research proposed, the selective isolation of microorganisms from activated sludge and surface water will be carried out. The microorganisms isolated will be identified biochemically and genetically. Furthermore, the biodegradation tests of selected azole antifungal agents will be performed in various model systems. Moreover, the research planned involve the analysis of the changes in cells metabolic activity through measurements of the cytotoxicity of tested compounds and activity of glutathione-S-transferase – the staple enzyme responsible for xenobiotics metabolism. The project proposed involve also the comprehensive analyses of interactions of selected group of chemical compounds on modifications of the cell properties of environmental microorganisms capable of degrading azole fungicides.

The results of research carried out within the frame of the project will allow for better understanding of the biodegradation of azole antifungal derivatives as well as changes in microbial cell able to decomposition of those compounds. The results will significantly broaden and deepen the current state of knowledge about the effects of bioactive compounds on the natural environment. Moreover, the results obtained within the project may be helpful in further designing of effective bioremediation process of such emerging contaminants as azole antifungal compounds.