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KWASY TŁUSZCZOWE BŁON KOMÓRKOWYCH BAKTERII JAKO WSKAŹNIKI TOKSYCZNOŚCI ZWIĄZKÓW AROMATYCZNYCH

Agnieszka Mrozik, Zofia Piotrowska-Seget, Sylwia Łabużek

Fatty acids of bacterial membranes as a biomarker of aromatic compounds toxicity

Abstract: In all bacteria fatty acids are found as a major component of their membrane lipids. The well-known spectrum of bacterial fatty acids comprises saturated, *cis, trans*-monounsaturated, diunsaturated, cyclopropane, hydroxyl and methyl-branched fatty acids. Recently a new type has been found as membrane constituents — polyunsaturated fatty acids.

The physical properties of bacterial membranes are determined by the composition of fatty acids. Some membrane active agents, including aromatic compounds, have a strong influence on membrane fluidity. These compounds dissolve in the cell membrane disturbing its integrity and affecting specific permeabilization. The hydrophobicity of an aromatic compound, expressed as its logP value, is a good indicator of its toxicity. Microorganisms however can adapt to many organic compounds by changing of their membrane fluidity. They can modify degree of saturation of fatty acids, the average chain length and the protein content. This mechanism is called "homeoviscosic adaptation". One of the key processes in the adaptation of some *Pseudomonas, Vibrio* and *Escherichia coli* strains, enabling them to tolerate aromatic compounds, appears to be the isomerization of *cis* — into *trans*-unsaturated fatty acids.

The analysis of microbial membrane lipids, specifically phospholipid fatty acids (PLFA) is a powerful tool for monitoring the microbial responses to changes in their environment. Phospholipids are extracted directly from environmental samples to characterise microorganisms within their communities. Microbial PLFA analysis provides quantitative insight into three important attributes of microbial communities, viable biomass, community structure and metabolic activity. Certain pollutants induce changes in some PLFA components such as ratio of saturated to unsaturated fatty acids, ratio of *trans* to *cis*-monoenoic unsaturated fatty acids, and the content of cyclopropane fatty acids. It might function as an indicator for the toxicity of many aromatic pollutants, particularly during *in situ* bioremediation and biotransformation processes.

1. Introduction. 2. Fatty acids of bacterial membranes. 3. Influence of aromatic compounds on bacterial membranes. 4. Adaptation mechanisms of bacteria to aromatic compounds. 5. Utility of fatty acids as biomarkers in environmental studies. 5.1. Isolation of phospholipid fatty acids (PLFA). 5.2. Analysis of phospholipid fatty acids (PLFA). 6. Summary

Agnieszka Mrozik i Sylwia Łabużek
Katedra Biochemii Uniwersytetu Śląskiego
Ul. Jagiellońska 28, 40-032 Katowice
e-mail: amrozik@us.edu.pl

Zofia Piotrowska-Seget
Katedra Mikrobiologii Uniwersytetu Śląskiego
Ul. Jagiellońska 28, 40-032 Katowice

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