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Immobilized Biocatalysts in NSAIDs Utilization

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Extended Abstract

In times of intense technological and social development, the usage of non-steroidal anti-inflammatory drugs (NSAIDs), like ibuprofen or naproxen, is continuously growing. Humans do not metabolize these kinds of compounds, and as a result, they are released into the environment in unmodified or slightly modified forms. Their accumulation in the environment may have a negative impact on living organisms [1]. By bioaugmentation of activated sludge in wastewater plants with properly designed immobilized biocatalysts, there is a solution to avoid releasing NSAIDs into the environment [2]. This study aimed to investigate the performance of immobilized *Planococcus* sp. S5 on a natural sponge derived from the *Luffa aegyptiaca* during naproxen cometabolic biodegradation to access its potential in bioremediation studies. The degradation of different naproxen doses (1, 2, 4, 6, 9, 12, or 15 mg/L) was monitored by free and immobilized bacterial cells.

Bacterial cells of *Planococcus* sp. S5 in planktonic form were able to degrade the drug in concentration in the range of 2-12 mg/L during 26-59 days. In comparison, immobilized S5 cells on the Luffa sponge revealed the ability to degrade the full range of analyzed naproxen concentrations during 11-55 days. Additionally, the analysis of Total Enzymatic Activity (TEA) showed the negative influence of increasing naproxen doses on the free and immobilized cells of the S5 strain.

This study revealed the beneficial effect of immobilization on the efficiency of naproxen cometabolic degradation by *Planococcus* sp. S5 strain. Formed on a Luffa sponge biofilm was able to degrade higher drug doses and the lower dose, which are often omitted by free suspended cells in bioremediation systems. Observed positive influence of immobilization revealed that it would be possible to use immobilized S5 cells on natural sponge in bioremediation experiments aimed to eliminate NSAIDs from aquatic environment for long period of time and in various concentration, even the trace amounts.

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References

[1] D. Wojcieszyńska, D. Domaradzka, K. Hupert-Kocurek, U. Guzik, "Enzymes involved in naproxen degradation by *Planococcus* sp. S5." in *Polish Journal of Microbiology,* 2016, vol. 2, pp. 177-182.

[2] A. Dzionek, D. Wojcieszyńska, M. Adamczyk-Habrajska, U. Guzik, "Enhanced degradation of naproxen by immobilization of *Bacillus thuringiensis* B1 (2015b) on loofah sponge" in *Molecules*, 2016, vol. *25*(4), pp. 872.