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Aptamer-based biosensors for ATP detection

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Adenosine triphosphate (ATP) is the main energy source in cells participating in cellular reactions in living organisms. It is formed in many biological processes. The deviation from normal intracellular ATP level has been attributed to various diseases, including hypoxia and malignant neoplasia. Therefore, monitoring of ATP levels has become an important element in the evaluation of cellular bioenergetics, abnormalities in cell metabolism, and disease control. In this work, we have explored the utilization of aptamers in the development of highly sensitive platforms for the determination of ATP. Aptamers provide considerable advantages as the recognition elements in biosensing, including high sensitivity, easy synthesis and purification, low cost, and the enhanced stability. In our experiments, we have employed a fluorescein (FAM)-labeled aptamer for the ATP detection. In the presence of ATP, the aptamer hybridizes with ATP to form an aptamer-ATP duplex, and exhibits strong FAM fluorescence quenching. The assay developed relies on the binding affinity of the aptamer towards ATP which is stronger than that towards other compounds. In order to test the applicability of the biosensor to real sample analysis, *in vitro* experiments have been carried out using Chinese Hamster Ovary cell line (CHO) and Human glioblastoma-astrocytoma (U-87 MG malignant glioma) cell line. The measurements of ATP levels were performed in the intact cells, as well as in the cells treated with various agents, able to stimulate or inhibit the ATP synthesis. The proposed method has a potential for utilization in measurements of cellular ATP production in different stages of disease development.

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Biography

Martyna Zagórska-Dziok completed a Master's degree in Biotechnology at the Jagiellonian University in Cracow. She is currently a Member of the Interdisciplinary PhD studies at the University of Life Sciences in Warsaw and a Member of the Polish Biophysical Society.

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