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Experimental Search for Optimal Solutions for the Monitoring of Dopamine in Human Organism

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ABSTRACT

In the contemporary world, the problem of human psychological health is growing in extremely huge scales. However, the reason of this extreme growth is not always hidden under disorders of some centers in the neocortex. Very frequently, there occur deviations, concerning to the information transition pathways between different centers of human brain. Here is discussed the possibility to monitor dopamine in human organism from the point of diagnosis of number of neurodegenerative diseases. Creation of biosensor for dopamine on the basis of nucleic acids, which will serve as an underlayer – sensitive to dopamine, is considered one of the possible variants of the monitoring. In the present paper, is was studied the complexes of dopamine with DNA by the spectral (absorption, fluorescence) methods, in the presence of intercalating compounds acridine orange (AO) and ethidium bromide (EtBr). The results revealed a competitive binding of dopamine and intercalator to DNA. It leads to the decreasing of EtBr and AO affinity decrease to DNA. Besides, it was studied the interaction of dopamine with single-stranded synthetic polynucleotide poly(rA) which is considered to be a potential underlayer, interacting with dopamine. The dopamine binding constant to DNA, RNA and single-stranded homopolynucleotides, especially poly(rA) is determined experimentally by the method of absorption spectroscopy. The data show that dopamine interacts with poly(rA) and the affinity to poly(rA) is significant. Between these two compounds, there exists some affinity, which can be used as an underlayer for the construction of biosensor for the concentration determination of dopamine in blood plasma and urine. Based on the experimental data, we assume that in the given work the following position is new: the dopamine concentration may be determined in the blood and urine, which makes possible to assess the probability of the initiating neurodegenerative disease and to facilitate the disease symptoms.

Keywords: dopamine, single-stranded synthetic polynucleotide, absorption spectroscopy, binding constant

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