Electrochemical Aptasensing Approach for Measuring Myelin Basic Protein Levels in Demyelination and Neurological Disorders

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Myelin basic protein (MBP) makes up to 30% of myelin and it is known to be released into the cerebrospinal fluid (CSF) as a bioindicator of demyelination in multiple sclerosis [1]. In addition, in case of another demyelinating disease or trauma of CNS, MBP is present as a biomarker in human blood serum [2].

Herein, MBP specific aptamer earlier developed for possible therapeutic purposes [3] in mouse model was applied as a bioreceptor for both mouse and human MBP (mMBP and hMBP, respectively) recognition. A biosensor for MBP detection and monitoring was developed by using graphene oxide (GO) integrated onto the working electrodes with aptamer immobilized to create a bioactive layer on the sensor surface for MBP binding. The measurements were carried out using electrochemical impedance spectroscopy (EIS). Using carbon-based nanomaterial with large surface area aggregated with aptamer showed high specificity and affinity to the target molecule and enabled selective and sensitive MBP determination.

The biosensing system designed was optimized and adjusted for application both in CSF and blood serum.

In CSF LOD was 0.65 ng/mL and in the blood serum 0.35 ng/mL correspondingly.

In the future perspective, this developed aptasensor can be implemented for development of prototype product for further clinical use in the MBP determination as PoC analysis.

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