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The determination of plasmatic activity of butyrylcholinesterase using screen printed voltammetric sensors

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We can distinguish two known cholinesterases: acetylcholinesterase and butyrylcholinesterase (BChE). While acetylcholinesterase has crucial importance in cholinergic nerves, BChE is an enzyme presented in quite high level in the both blood plasma where it participates in detoxification reactions and in the organs as well. The BChE presented in plasma comes from liver parenchyma from which is secreted into circulation of blood. Lack of BChE plasmatic activity can be used for biochemical diagnosis as a marker of poisoning with some neurotoxins but it can also appoint at liver damage. In the present work, the attention is given to construction of an electrochemical method which can be used for a reliable and fast assay of BChE activity in biological samples including plasma. Standard optical, Ellman's method was successfully used for validation of the new method. Screen printed electrodes were used as a platform and butyrylthiocholine as a substrate for BChE. The methods were firstly performed on purified human BChE and the lowest limit of detection, maximal velocity and Michaelis constant were calculated for the both methods. Limit of detection for the electrochemical protocol was less than 1.10×10^{-9} kat being better than limit of detection for the standard optical protocol. The limit of detection were significantly better than the lowest expected activity in the human plasma. After optimization, the methods were verified on human plasma samples. No interference caused by acetylcholinesterase was revealed and the electrochemical method was well correlated ($r=0.998$) with the standard Ellman's method. We can conclude our experiments by a statement that the electrochemical method is suitable for a routine examination of human plasma.

Biography

Miroslav Pohanka completed his Graduation in Chemistry, Doctor of Natural Science (RNDr) in Biochemistry, PhD in Biochemistry at Masaryk University and; Doctor of Sciences in Analytical Chemistry at Academy of Sciences, Czech Republic. After that, he became Associate Professor in Toxicology at University of Defense, Czech Republic. Currently, he is a Professor in Analytical Chemistry at University of Pardubice. He is an author of approx. 200 papers in journals.

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