Assay of nerve agents by acetylcholinesterase based biosensor

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Abstract

Electrochemical biosensor based on intercepted acetylcholinesterase (AChE; EC 3.1.1.7) was performed for assay of well known nerve agents tabun, sarin, soman, cyclosarin, and VX. Biosensor used AChE as a biorecognition element. Presence of nerve agent was accompanied by strong inhibition of AChE resulting by decrease of detected current. Enzyme activity is easily measurable by electrochemical oxidation of thiocholine created from acetylthiocholine (ATChCl) by AChE-catalyzed hydrolysis. ATChCl is oxidized by applied voltage 400 mV. Tested nerve agents were successfully assayed. The best limits of detection were achieved for sarin (5.88×10^{-10} M) and VX (8.51×10^{-10} M) after one-minute assay. Biosensor was found long-term stable at fridge as well as laboratory temperature. Biosensor could be performed even after one-month storage in laboratory temperature.

Keywords: biosensor, oxime, acetylcholinesterase, butyrylcholinesterase, reactivation

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