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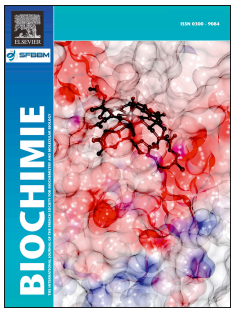

1-Naphthyl acetate: a chromogenic substrate for the detection of erythrocyte acetylcholinesterase activity

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Abstract

Erythrocyte acetylcholinesterase (AChE) is a preferred biomarker for the detection of organophosphorus poisoning. Acetylthiocholine (ATCh) is the most popular substrate for the detection of AChE activity. However, oximolysis is a prominent feature with ATCh. In this context, we have searched alternative substrates for AChE using *in silico* tools for screening of a better substrate. The *in silico* approach was performed to understand the fitness and the Total Interaction Energy (TIE) of substrates for AChE. The alternative substrates for AChE were screened in terms of high Goldscore and favorable TIE in comparison to acetylcholine (ACh)-AChE complex and other relevant esterases. Among the screened substrates, 1-Naphthyl acetate (1-NA) exhibited the most favorable interaction with AChE in terms of highest TIE and corresponding high Goldscore. The Molecular Dynamic (MD) simulation of the 1-NA-AChE complex showed a stable complex formation over a period of 5 ns. The results obtained in the *in silico* studies were validated *in vitro* using pure erythrocyte AChE and hemolysate. We observed 1-NA to be a better alternative substrate for AChE than ATCh in terms of lower Km value. Its specificity appeared at least similar to ATCh. Therefore, we propose that 1-NA can be an attractive chromogenic substrate for the measurement of AChE activity, and it possess the potential to detect organophosphorus pesticide (OP) poisoning.

Keywords: Organophosphorus pesticides; acetylcholinesterase; 1-naphthyl acetate; *in silico* tools