Alanine Reverses the Inhibitory Effect of Phenylalanine on Acetylcholinesterase Activity

Stylianos Tsakirisa,* and Kleopatra H. Schulpis b

a Department of Experimental Physiology, Medical School, University of Athens, P.O. Box 65257, GR-154 01 Athens, Greece. Fax: 0030-1-7775295. E-mail: stsakir@cc.uoa.gr

b Inborn Errors of Metabolism Department, Institute of Child Health, Aghia Sophia Children’s Hospital, GR-115 27 Athens, Greece

* Author for correspondence and reprint requests

Z. Naturforsch. 57c, 506–511 (2002); received November 26, 2001/January 9, 2002

Brain Acetylcholinesterase, l-Phenylalanine, l-Alanine

The aim of this work was to evaluate, in vitro, the effect of l-alanine (Ala) on suckling rat brain acetylcholinesterase (AChE) and on eel *Electrophorus electricus* pure AChE inhibited by l-phenylalanine (Phe) as well as to investigate whether Phe or Ala is a competitive inhibitor or an effector of the enzyme. AChE activity was determined in brain homogenates and in the pure enzyme after 1 h preincubation with 1.2 mM of Phe or Ala as well as with Phe plus Ala. The activity of the pure AChE was also determined using as a substrate different amounts of acetylthiocholine. Ala reversed completely the inhibited AChE by Phe (18–20% in 500–600 µM substrate, p<0.01). Lineweaver-Burk plots showed that $V_{max}$ remained unchanged. However, $K_M$ was found increased with Phe (150%, p<0.001), decreased with Ala alone (50%, p<0.001) and unaltered with Phe plus Ala. It is suggested that: a) Phe presents a competitive inhibitory action with the substrate whereas Ala a competitive activation; b) Ala competition with Phe might unbind the latter from AChE molecule inducing the enzyme stimulation; c) Ala might reverse the inhibitory effect of Phe on brain AChE in phenylketonuric patients, if these results are extended into the in vivo reality.