

Effects of L-Phenylalanine on Acetylcholinesterase, (Na⁺,K⁺)-ATPase and Mg²⁺-ATPase Activities in Adult Rat Whole Brain and Frontal Cortex

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The effect of different L-phenylalanine (Phe) concentrations (0.12–12.1 mM) on acetylcholinesterase (AChE), (Na⁺,K⁺)-ATPase and Mg²⁺-ATPase activities was investigated in homogenates of adult rat whole brain and frontal cortex at 37 °C. AChE, (Na⁺,K⁺)-ATPase and Mg²⁺-ATPase activities were determined after preincubation with Phe. AChE activity in both tissues showed a decrease up to 18% (p<0.01) with Phe. Whole brain Na⁺,K⁺-ATPase was stimulated by 30–35% (p<0.01) with high Phe concentrations, while frontal cortex Na⁺,K⁺-ATPase was stimulated by 50–55% (p<0.001). Mg²⁺-ATPase activity was increased only in frontal cortex with high Phe concentrations. It is suggested that: a) The inhibitory effect of Phe on brain AChE is not influenced by developmental factors, while the stimulation of Phe on brain Na⁺,K⁺-ATPase is indeed affected; b) The stimulatory effect of Phe on rat whole brain Na⁺,K⁺-ATPase is decreased with age; c) Na⁺,K⁺-ATPase is selectively more stimulated by high Phe concentrations in frontal cortex than in whole brain homogenate; d) High (toxic) Phe concentrations can affect Mg²⁺-ATPase activity in frontal cortex, but not in whole brain, thus modulating the amount of intracellular Mg²⁺.