Tissue Cholinesterases. A Comparative Study of Their Kinetic Properties

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The substrate saturation and temperature-dependent kinetic properties of soluble and membrane-bound forms of acetylcholinestarase (AChE) from brain and butyrylcholinesterase (BChE) from heart and liver were examined. In simultaneous studies these parameters were also measured for AChE in erythrocyte membranes and for BChE in the serum from rat and humans. For both soluble and membrane-bound forms of the enzyme from the three tissues, two components were discernible. In the brain, K_m of component I (high affinity) and component II (low affinity) was somewhat higher in membrane-bound form than that of the soluble form components, while the V_{max} values were significantly higher by about five fold. In the heart, K_m of component II was lower in membrane-bound form than in the soluble form, while V_{max} for both the components was about four to six fold higher in the membrane-bound form. In the liver, V_{max} was marginally higher for the two components of the membrane-bound enzyme; the K_m only of component I was higher by a factor of 2. In the rat erythrocyte membranes three components of AChE were present showing increasing values of K_m and V_{max}. In contrast, in the human erythrocyte membranes only two components could be detected; the one corresponding to component II of rat erythrocyte membranes was absent. In the rat serum two components of BChE were present while the human serum was found to possess three components. Component I of the human serum was missing in the rat serum. Temperature kinetics studies revealed that the Arrhenius plots were biphasic for most of the systems except for human serum. Membrane binding of the enzyme resulted in decreased energy of activation with shift in phase transition temperature (T_t) to near physiological temperature.