NON-GENOMIC EFFECT OF ESTRADIOL ON PLASMA MEMBRANE CALCIUM PUMP ACTIVITY IN VITRO

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The aim of the presented study was to compare the effect of 17-β-estradiol on the hydrolytic activity of plasma membrane calcium pump (PMCA) purified from excitable (rat cortical synaptosomes) and non-excitable (human erythrocytes) cells. Both types of cell membranes contained different composition of the PMCA isoforms. To elucidate if the hormone action could depend on structure of PMCA protein, we assayed the hormone effect on Ca\(^{2+}\)-ATP-ases pretreated for 15 and 40 min with trypsin. The full length and trypsin-treated Ca\(^{2+}\)-ATP-ases were next incubated with 17-β-estradiol at a concentration of 10\(^{-9}\) and 10\(^{-7}\) M. In addition, stimulation of calcium pumps by naturally existing activator, calmodulin, was tested. The activity of synaptosomal and erythrocyte Ca\(^{2+}\)-ATP-ases was differently altered in the trypsin-treated samples. At physiologically relevant concentration of estradiol (10\(^{-9}\) M), a significant enhancement of the activity was observed for synaptosomal Ca\(^{2+}\)-ATP-ase, and a further increase occurred in the enzyme treated with trypsin for 15 min. The highest activity of erythrocyte calcium pump was induced after 40 min of incubation with protease. Moreover, the potency of the truncated calcium pump to promote ATP hydrolysis was approximately 2-fold elevated in the presence of 17-β-estradiol. Calmodulin significantly stimulated the Ca\(^{2+}\)-ATP-ase, but only the erythrocyte enzyme digested with trypsin for 15 min. It may be suggested that PMCA is a target for estradiol, that shows different mechanisms of action depending on isoform compositions and structural features of the enzyme.

Key words: calcium pump, 17-β – estradiol, synaptosomes, erythrocytes, regulation

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