ROLE OF NEUROCALCIN δ DIMERIZATION IN TRANSLOCATION OF THE PROTEIN IN HIPPOCAMPAL NEURONS

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Neuronal Ca^{2+} sensor (NCS) proteins, Neurocalcin δ (NCALD) and Hippocalcin (HPCA) control many neuronal functions via their differential Ca^{2+}-dependent translocation from the cytosol to the plasma membrane. In spite of the fact that both proteins have highly similar amino acid (AA) sequences, they demonstrate a great difference in Ca^{2+} affinity and kinetic properties of translocation to the plasma membrane. It has been suggested that these differences between the proteins are due to Ca^{2+}-dependent dimerization of Neurocalcin δ, which is not observed for Hippocalcin.

To test this hypothesis, Neurocalcin δ mutant (SKA Mut) revealing no dimerization *in vitro*, was used. The mutant and wild type NCALD were tagged by fluorescent proteins and co-expressed paired wise in cultured rat hippocampal neurons. To induce Ca^{2+}-dependent translocations of proteins, we applied depolarizations of different duration using a patch clamp technique.

Surprisingly, disruption of Ca^{2+}-dependent dimerization of NCALD had only a minor influence on Ca^{2+}-sensitivity without a significant effect on decay time of translocation. Ca^{2+}-dependent NCALD insertion into the plasma membrane occurring before Ca^{2+}-dependent dimerization may explain this result. According to estimations conducted using our experimental results, characteristic diffusion time for NCALD insertion into the plasma membrane is about 3-fold lower than characteristic diffusion time for interaction of two NCALD in the dendritic tree of hippocampal neurons. In summary, Ca^{2+}-dependent dimerization of Neurocalcin δ in the cytosol does not play a significant role in determination of biophysical properties of this protein.