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FUNCTIONAL COUPLING OF ION CHANNELS IN THE PROCESS OF MECHANO-DEPENDENT ACTIVATION IN K562 CELLS

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Mechanically gated cation channels that are activated by plasma membrane deformation are the key players in the transduction of mechanical signals from cell surface to cytoplasmic structures. It remained unclear how mechanodependent reactions involving ion channels are realized in native cells. In this study, we analyzed the development of single channel activity in human myeloid leukemia K562 cell line in response to the application of mechanical stimulus by stretching the fragment of plasma membrane. Registration of ionic currents using the classical variants

of patch clamp method revealed functional clustering and the interaction of various types of the channels in the plasma membrane during mechanotransduction. Particularly, coupled activation of mechanosensitive calcium-permeable channels and potassium calcium-activated channels was found in K562 cells. Real-time current records demonstrate that calcium influx from the extracellular environment into the cytoplasm via mechanosensitive channels activates colocalized potassium channels that do not have their own mechanical sensitivity. In experiments on K562 cells and transformed 3T3-SV40 fibroblasts, functional coupling of the channels during their mechano-dependent activation was shown after incubation of cells with F-actin destructor cytochalasin D. The results allow us to assume that functional clusters of potassium SK channels and stretch-activated cation Piezo1/2 channels are presented in plasma membrane of K562 and 3T3-SV40 cells.

Keywords: patch clamp, mechanosensitive channels, cell membrane, local calcium influx, actin cytoskeleton, human myeloid leukemia K562 cells