Functional Activity of Sodium Channels ENaC in Human Endometrial Mesenchymal Stem Cells

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The work is aimed to reveal the functional activity of sodium channels ENaC in human endometrial mesenchymal stem cells (eMSC). Immunofluorescent staining of the cells showed the presence of the main pore-forming alpha-subunit of ENaC in eMSC. For the electrophysiological study of sodium channels and the analysis of the effects of potential ENaC activators, we used the possibility of unitary currents recording in plasma membrane patch on native cell (cell-attached variant). In experiments on eMSC, background activity of sodium channels was found, their activation was shown in response to cytochalasin D-induced actin cytoskeleton disassembly; the biophysical properties of single channels were estimated. Typical channel activity was also observed when serine protease trypsin, a known stimulator of ENaC channels, was added to the outside of the membrane patch. The current-voltage characteristics of sodium channels activated by the action of cytoskeleton destructor or extracellular protease were similar: unitary conductance was 11–13 pS. Thus, the physiological pathways of ENaC channel stimulation in human endometrial stem cells were identified. Revealed intracellular and extracellular mechanisms of ENaC channel regulation can provide rapid changes in the sodium permeability of the plasma membrane of stem cells.

Keywords: human mesenchymal stem cells, patch clamp, plasma membrane, sodium channels ENaC, actin cytoskeleton