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Donnan Potential as a Tool for Stable Transmembrane Polarization in System Membrane Vesicle Incubation Medium

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Transmembrane potential (V_{mem}) refers to the voltage difference across a cells bilayer membrane that is established by the balance of intracellular and extracellular ionic concentrations. Specificity has been uncovered in the relationship between changes in V_{mem} levels and alteration of cell function [1, 2] and different membrane proteins [3, 4].

Donnan potential emerges when a semipermeable membrane between two compartments is used and there is different concentration of non-permeable ion inside it. But its value in cells is not high, in range 3-8 mV [5]. Earlier, prof. Kosterin assumed [6] that the value of Donnan potential might be higher if volume of compartments is slightly different. So, using principles of particle conservation, equality of electrochemical potential, and electrical neutrality the general formula of Donnan potential was derived. This formula uses concentration of all salts inside and outside of vesicle and ratio of compartments volume. It was shown that the lower ratio (inside:outside) the higher Donnan potential could be up to 75 mV. Thus, Donnan potential may be used as a tool for creating stable membrane potential of vesicle, which can have practical and methodological implications for investigation the influence of the transmembrane potential on the function of membrane protein.

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