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Cell hydration as a primary messenger for signal transduction in cells

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Abstract

Living cells have metabolic controlling asymmetric distribution of organic and inorganic substances between intra- and extracellular mediums which is controlled by cell metabolism. Therefore, the bioavailability and bioequivalence of factors will be determined by their ability to stabilize or increase these chemical gradients on the membrane. As cell surface membrane is highly permeable for water, it is predicted that osmotic gradients on the membrane have transient character and appear in response to disbalance of gradient and antigradient substance transporting through the membrane. Based on the fact that cell hydration has fundamental role in metabolic activity of cell membrane and intracellular macromolecules, water gradient-induced changing of cell hydration can be considered as a primary messenger for signal transduction in cells. According to classic membrane theory the signal transduction in cells is realized through the changing of the membrane electro-conductive property. However, a great number of experimental data on the biological effect of extremely weak chemical and physical signals on different objects, unable to activate ionic channels, cannot be explained from the point of this theory. Therefore, new approaches are needed to explain weak under threshold signal transduction in living cells. In the lecture experimental data obtained on eucariot and procariot organisms will be presented on the sensitivity of the metabolic controlling of cell hydration to weak signals having energy far from the thermal threshold, as well as on the role of cell hydration in regulation of cell functional activity