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Intracellular water absorption is a primary sensor for extracellular and intracellular signals

The cell membrane (CM) has a higher permeability for water. Furthermore, because of the existence of special water channels (aqua pores) in CM, the water transports through the membrane take place much faster than predicted by simple osmotic diffusion. Therefore the environmental factors-induced osmotic gradients on membrane generated by extracellular and intracellular factors could have a transient characters and any factor- induced changes thermodynamic activity of membrane bathing aqua mediums could generate water fluxes through the CM. It has been shown that such transient water fluxes through CM have strong modulation effects on membrane conductive function as well as on the water influx- and efflux-induced cell hydration and dehydration leading to activation and inactivation of metabolic activity of cell, respectively. The cell hydration regulates the cell metabolic activity by two pathways: a) “folding” of intracellular macromolecules and b) surface-dependent regulation of the number of functional active protein molecules (enzymes, receptors, ionic channels) in CM. Therefore, the factor induced changes in cell hydration serve as gates for switching on the cell adaptive metabolic pathways restoring the initial hydrated state of cell. The dysfunction of intracellular signaling system controlling cell hydration serves as the primary reason for generation of cell pathology. By our study was shown that the age dependent dysfunction of α 3 Na/K ATPase-dependent signaling system is the main reason of the increase risk of generation of different medical disorders. It is suggested that the sensitivity of factor-induced tissue hydration could serve as a hallmark for health status of organism.

Biography

Sinerik Ayrapetyan has completed his PhD and Doctorate respectively from Bogomoletz Institute of Physiology NAS of Ukraine in 1970 and 1980. He is the President of UNESCO Chair-Life Sciences International Postgraduate Center from 1999 till now. He has published more than 120 papers in reputed journals. He is a member of an editorial board of 9 international journals. His research interest is in the study of metabolic mechanism regulation of cell hydration in norm and pathology. He has discovered that the protein molecules in the membrane-determining their activities are in functionally active and inactive state depending on membrane packing. His current research activity is the role of intracellular signaling system controlling cell hydration in norm and pathology.

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