

2nd International Conference & Expo on

Biopharmaceutics and Biologic Drugs

September 14-16, 2016 San Antonio, USA



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The dysfunction of intracellular signaling system controlling cell hydration as a primary mechanism for cell pathology

Cell hydration determines its functional activity via “folding-unfolding” mechanism of intracellular macro-molecules and cell surface-dependent changes of protein molecules’ activity, having enzymes, receptors and ionic channels forming properties. Therefore, the metabolically controlled cell hydration is of vital importance for living cells. The facts that intracellular osmotic pressure exceeds the extracellular one and that the membrane permeability for water is much higher than for ions, the osmotically driven water influx is balanced by metabolically generated water efflux from the cell. Our data have shown that net water influx and efflux through membrane activate and inactivate inward going ionic current in membrane. Therefore, this makes the ability of metabolic compensation of osmotically driven water influx as a marker for estimation of beneficial and harmful effects of any physical and chemical factors on cells and organisms. Among the number of metabolic mechanisms involved in regulation of cell hydration, Na^+/K^+ -pump has a central role, which is due to both generations of Na^+ gradients on membrane, serving as energy sources for a number of secondary ionic transporters in membrane, and water efflux from the cells. Our recent study has shown that the dysfunction of Na^+/K^+ -ATPase $\alpha 3$ isoform-dependent signaling system controlling cell hydration is the common primary mechanism for cell pathology. In may talk the suggestion on the use of $\alpha 3$ isoform-dependent signaling system controlling cell hydration as a novel therapeutic target for treatment of different diseases will be discussed.

Biography

Sinerik Ayrapetyan has completed his PhD in Cell Biophysics in the Institute of Physiology of Ukraine Academy of Sciences, Kiev. He is the Head of Research Council and the Coordinator of UNESCO Chair in Life Sciences at Life Sciences International Postgraduate Educational Center, Yerevan, Armenia. His current research interest is “Intracellular Signaling System in Norm and Pathology”. He has published 7 international books and 115 papers. He is an Editor in Chief of the journal “Bioavailability and Bioequivalence”, and a Member of Editorial Board of the journals: “Electromagnetic Biology and Medicine”, “Journal of International Dental and Medical Research”, “ISRN Biophysics”, “Advances in Life Sciences”, “Applied Pharmacy”, “European Journal of Biophysics”, “Biochimica et Biophysica Acta” etc. He is a member of International Coordination Council of WHO and a number of professional international societies.

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