Ion Pumps Boom: from yeast to cancer bioenergetics

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Cells sense and respond to a variety of environment-derived stimuli such as the availability of water, nutrients and toxic elements as well as a myriad of mechanical and chemical signals derived from biotic and abiotic sources. Such a complex stimulus-rich environment provides information to well-integrated colonial or tissue patterns. Besides the widely explored Ca^{2+} signatures, changes in pH and membrane potential are also emerging as important signal transduction elements of the sensory systems in eukaryotic cells. As in fungi and plant cells, cancer cells have also been found to energize their cell membranes by establishing steep electrochemical gradients driven by H^+ pumps, which are key energy transduction systems essential to the cell nutrition as well as to control the cytosolic and extracellular pH and membrane potentials. The presentation will cover studies underlying a role for the H^+ pumps of plasmalemma and endomembranes in signal transduction and some related ion signaling events orchestrated by the main H^+ transport systems. Evidences will be provided for distinct spatial and temporal signatures not only of Ca^{2+}, but also of H^+ ions as encoding and transducing information in different eukaryotic systems.

Key words: ion signals, proton ATPases, co-evolutionary bioenergetics