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Mini Review

Proton Paths of Cardiac Immune Reflex

Yang I Pachankis*

Universal Life Church, California, USA

***Corresponding author:** Yang I Pachankis, Universal Life Church, Modesto, California, USA.

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Abstract

The literature review synthesizes the cardiac cross in immunological activities through adenosine triphosphatase (ATP). Biochemical proton-coupled electron transfer (PCET) is intimately associated with human physiological and pathogenic attributes. The review is motivated by immunological viral pathogens such as SARS-CoV-2 and HIV-1, and is thus structured. The organic and inorganic chemistries involved in PCET will further the knowledge on physiological correlations between cardiac activities and neurological developments.

Keywords: Adenosine triphosphatase; Immune reflex; Proton-coupled electron transfer; Proton-gating; Vegetative nervous system

Transmembrane Fusogenicity

Functional protons contribute to proton-coupled electron transfer (PCET) in cellular biochemistry. PCET may be pH dependent or independent, and its capacities in converting substrate pH values are of particular interests to homeostasis, pharmacokinetics, pathogen, and etc. [1]. Voltage-gated proton channels (Hv) exist widely from microorganisms to animal physiology with cell membranes, modulated by pH with strong temperature dependence and change pH in turn with depolarization [2]. Structural features exist in the ion channel pathways such as tetrameric voltage-gated K^+, Na^+, and Ca^{2+} helix ion channels, subsequently inducing intracellular and transmembrane flows through gating and cation depolarization [2,3]. It is not yet clear how positrons react to the anions with transient ion pairs with the depolarizing pulse in the open and gating momenta of PCET, but the gating pore may provide further insights into the inner structures of the process [3]. From pentameric ligand-gated ion channel (pLGIC), the Gloeobacter violaceus (GLIC) detection precision went from 5-10Å to 2-3Å on proton-gating process study, indicating that axial charges open the proton receptor with a nonconductive ion channel, break the inter facial hydrogen-bond network, and form a secondary electrostatic triad with hydrophobic residues before the gating process with proton-elicited channel currents during couple-binding [1,4]. Hydroxyl anions act both as the proton-receptor and transmembrane medium in the process, and the protonic motive force equation for adenosine triphosphatase (ATP) synthesis was theorized as [5]:

$$pmf = \Delta\psi + \frac{2.3RT}{F} log_{10} \frac{\left[H^+_{pB}\right]}{\left[H^+_{nB}\right]} + \frac{2.3RT}{F} log_{10} \left(1 + \frac{\left[H^+_{L}\right]}{\left[H^+_{pB}\right]}\right) \quad (1)$$

From

$$pmf = \Delta\psi + \frac{2.3RT}{F} \Delta pH \quad (2)$$

The evidence suggests the homeostasis of biochemical electrostasis and hydrostasis is interconnected by PCET, and regulates oxidization in the transmembrane domain [6,7].

Protongenesis

It is well-experimented with wildtype zebrafish embryos for

the inference that maternal proton homeostasis affects, through signaling, mammal and human fertilized eggs' cell proliferation and prenatal developments [8-10]. The apoptotic experiments negatively indicated to the cardiac, immunological, and neurological development correlates between maternal and embryonic PCET [9,10]. With the gravitational differences in fetal position on geostationary terms, maternal umbilical cord changes the [de]polarization circuits in prevented apoptosis in prenatal development [11-13]. Apart from exterior sources from digestive metabolism such as glycolysis in the cytoplasm and secondary transmembrane protons, de novo proton-generation comes from ATP production in mitochondria [14]. In turn, cardiac mitochondria regulates and energizes ATP levels, with mitoflashes correlated to proton motive force (PMF) in mitochondrial reactive oxygen species (ROS) production, during which heat is generated by electron transport chain (ETC) [15,16]. Substrate oxidization consequently influences cardiac rhythms. ETC and ROS are influenced by multiple factors between the primary and secondary proton productions, with the involvement of T cells, submitochondrial particles, and transmembrane domain [16,17]. The plausibilities that cytochrome oxidase also contain a proton pump put ethnic differences in the ATP-driven proton injection and pumping cycles by exponential ratios in the reactive oxidization processes [17-19].

Neurotransmission and Exocytosis

The hydrophilic proton transfer paths separate the protein motifs between proton extruders and proton sensors with Hv[14,20,21]. Electrochemical proton gradient in the transmembrane domain, typically generated by the vacuolar-type ATP (V-ATPase), energizes synaptic vesicles in neurons and in chromaffin granules in neuroendocrine chromaffin cells, accumulating neurotransmitters [22]. The V-ATPase V0 subunits to V1 receptor accumulation is pH dependent with Hv dynamics in the transmembrane domain, implying the involvement of PMF [2,21-23]. The at least 11 V-ATPase subunits' organic and inorganic chemical potentials in receptor-dependent and acceptor-dependent biochemical and chemical reactions may shed new light in the interlinks in neurobiology, cellular biology, and biochemical materials [21,24,25]. The [de]polarization structural constraints in the V0-V1 complex phase correlates blood-borne physiological and pathological signaling with the immune reflexes and neuronal activities through exocytosis, extracellular nuclides, and the nerve terminals, guarded by the blood-brain barrier [11,22,26,27]. The fusogenic activities in the transmembrane domain can, therefore, influence respiratory, circulatory, neurological, and prenatal activities with the biochemical chain reactions.

Review Summary

The literature review organized the proton functions in the transmembrane interlink from ATP. PCET involved in the cardiac activities through ion channels correlate respiratory, circulatory, neuronal, and prenatal activities. Proton-gating with receptor and acceptor activities in the transmembrane domain influences biochemical oxidization during physiological depolarization and repolarization in the ATP synthesis cycles through hydrostaisis and hydro-equilibrium. Electrochemical gradient of proton activities in V-ATPase is the major conjunction in physiological PCET with immune reflex. The probabilities of biochemical exocytosis and apoptosis depend on the electrochemical force generated from PCET, and put enzymes into focus for further studies. Cardiac activities are tightly related to immune activities and immune reflex by ATP. Further research into the prenatal proton activities' influence on neurological developments with the development of umbilical cord may open new doors for consciousness research.

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None.

Conflict of Interest

Yang I Pachankis is developing treatment solutions for SARS-CoV-2 and discussing investments with potential stakeholders.

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