Original Paper

Characteristics of hepatocyte rough endoplasmic reticulum single cationic channel in Streptozocin-induced diabetic Rats

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Abstract

Background and Objective: The role of ion channels and particularly cationic channels in the pathogenesis of various diseases are being considered carefully. The diabetes mellitus is a common disease which is initiated by ion channel disturbances. This study was done to determine the characteristics of hepatocyte rough endoplasmic reticulum single cationic channel in Streptozocin-induced diabetic rats.

Materials and Methods: This experimental study was done on 10 male adult Wistar rats and animals were randomly allocated into diabetic and control groups. Diabetes induced by STZ (65 mg/kg/bw) intraperitonally. Rough endoplasmic reticulum vesicles were extracted following rat liver excision, homogenization and ultracentrifuging. The bilayer membrane formation was prepared by painting phosphatidylcholine on 250µM aperture in between Cis and Trans sides. The RER vesicles incorporation was performed through gentle and delicate touch of membrane using a dentistry needle. The Pclamp9 software was used for ion channel activity characteristic analysis.

Results: The cationic channel current amplitude did not change significantly in voltages more than +30 mV but their open probability (Po) decreased in diabetic group (P<0.05). More severe changes in channel activity were seen in potentials less than the reverse potential. In addition to significant increase of channel Po (P<0.05), also, the channel unitary currents were significantly decreased (P<0.05). The mean current amplitude and channel open probability in voltage +40 mV were 17±2.14 pA and 0.68±0.01 in control group respectively, whereas, the values of these parameters reached to 18.5±2.5 and 0.26±0.03, respectively. In voltage -10 mV, the values of mean current amplitude and Po were -22.3±2.14 pA and <0.1 in control group, respectively but the values changed to -13.1±0.08 and 0.62±0.03 in diabetic group.

Conclusion: It seems that RER cationic channel is involved in metabolic changes which cause by diabetes mellitus and this disease can cause probably a channel gating kinetic and behavior change by inducing metabolic stresses.

Keywords: Endoplasmic Reticulum, Cationic Channel, Single Channel Recording, Bilayer Lipid Membrane, Diabetes mellitus

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Received 10 January 2011 Revised 23 April 2011 Accepted 26 April 2011