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Use of Impedance Spectroscopy to Probe Changes in Mitochondrial Membrane Potential ROOPLEKHA C. MITRA, MARTHA Y. SUÁREZ VILLAGRÁN, JAREK WOSIK, WANDA ZAGOZDZON WOSIK, JOHN H. MILLER, JR[1], University of Houston — The synthesis of ATP is driven by proton gradient and electrical potential across the mitochondrial inner membrane. It's electrical properties correlates with its physiological and pathological status. Electrical impedance spectroscopy is a non-invasive and relatively low cost technique where the impedance measurements monitors the underlying biological processes to determine parameters for biomarker studies. In this work we implement a multi frequency $(1kHz - 10MHz)$ bio electrical impedance to describe the changes in the electrical properties of mitochondria. The experimental strategy involved treating isolated mitochondria with the substrate succinate $(200mM)$ in vivo to stimulate the activity of succinate dehydrogenase. Subsequent variability is introduced by the addition of different trifluorocarbonylcyanide-phenylhydrazone $(25\mu M < [FCCP] < 50\mu M)$ and dopamine $(50nM < [DA] < 0.5M)$ concentration. We observe that succinate alone lead to an increase in the mitochondrial membrane potential $\Delta\Psi_m$. Dielectric spectroscopy measurements show a direct correlation between FCCP concentration and impedance and higher DA concentrations display marked decrease of membrane potential indicating a significantly reduced mitochondrial respiratory control.

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