Redox Balance and ATP/ADP Recycling Activity by Mitochondrial Hexocinase during brain's development: Is There any Correlation?

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INTRODUCTION: The brain has the highest energy cost in mammals. It consumes 20% of the body's glucose and oxygen while weighting only 2% of the body weight. This high oxidative metabolism leads to a high oxidative environment due to the high capacity of the brain mitochondria to produce Reactive Oxygen Species (ROS) and its low antioxidant capacity. It's been shown, that about 90% of the brain's Hexokinase 1 (mHKI) is bound to mitochondrial outer membrane and its activity modulates the rate of Mitochondrial Membrane Potencial-dependent ROS produced. During development, there is an increase of the mitochondrial content and oxygen consumption rate and some antioxidant enzymes are implemented, suggesting a developing necessity to regulate ROS. **OBJECTIVE:** Study the relation between mHKI activity and the oxidative metabolism and ROS production during development. **MATERIAL E METHODS:** Rat brain mitochondria were isolated through a percoll gradient and used to study oxygen consumption by high resolution respirometry and ROS production with the Amplex method. mHKI and antioxidant enzymes activities will be measured by spectrometry methods. **DISCUSSION AND RESULTS.** We showed that the oxygen consumption development is closely followed by the ROS production and the mHKI activity, the latter having a high correlation value with de ROS production (r^2 = 0,79), which does not happen with the mitochondrial antioxidant enzymes such as Glutathione Reductase (r^2 = 0,029), Glutathione Peroxidase (r^2 = 0,008) and Thioredoxin Reductase (r^2 = -0,6). Despite the low activity during early stages, since post natal day 7, the mHK1 activity is able to reduce as much as 90% of total ROS production during succinate oxidation. **CONCLUSION:** Although having low activity on early stages, mHK1 can regulate the production of ROS, and then may contribute to early ROS signaling during post natal brain development.

Key Words: Mitochondria, Hexokinase I, ROS, Brain, Development

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