METABOLIC PROFILE ANALYSIS OF ADULT STEM CELLS DERIVED FROM ADIPOSE TISSUE


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The metabolic profile plays an important role in determining cell proliferation and differentiation. Some studies demonstrate that careful manipulation of oxidative metabolism can direct the differentiation of adult stem cells. For this reason, a better understanding of the metabolic profile during the phases of cell proliferation and commitment will provide greater insight into the basic biology of these cells, allowing future applications. Therefore, the objective of this work is to evaluate the metabolic changes during the first steps of adipogenic differentiation of human adipose tissue-derived stromal cells (hASC). hASCs from at least three patients were isolated, cultured, characterized and maintained under differentiation conditions during 3 and 7 days. First, we monitored oxygen consumption by high-resolution respirometry with an Oxygraph-2k. Thereafter, we analyzed the mitochondrial mass and membrane potential using Mitotracker Red and Rhodamine 123 respectively. Reactive oxygen species (ROS) generation was assessed using 2',7'-dichlorofluorescein diacetate (DCFH-DA) probe. We also analyzed the catalase activity and GSH concentration in order to evaluate the antioxidant profile of the cells. Lipid peroxidation was assessed using diphenyl-1-pyrenylphosphine (DPPP). These assays showed us that 7 days of adipogenic induction are required to stimulate the cells to consume more oxygen and to increase the mitochondrial activity, indicating organelle maturation and also a transition from glycolytic to oxidative metabolism. ROS production was only increased in 3 days of induction and may be related to the differentiation commitment. ROS production did not change after 7 days of induction, but at the same time we observed an increased activity of antioxidant enzymes such as catalase and GSH, as well as a lipid peroxidation reduction. These results indicate that a short period of differentiation induction is able to change the energetic and oxidative metabolic profile of these cells as well as stimulating cytoprotection processes.

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