

Abstract

Mesenchymal stem cells (MSCs) have the ability to modulate the immune response. They use several mechanisms to affect the function of immune cells, and mitochondrial transfer is one of them. Receiving mitochondria from MSCs induces metabolic changes in immune cells, thereby promoting their shift to an anti-inflammatory phenotype. Due to their properties, MSCs have a potential to be used in therapies, for example in a treatment of autoimmune diseases. The problem of MSCs-based therapies is their low efficacy, mainly due to the high mortality of stem cells after transplantation. In order to achieve at least some effect, the large number of cells is needed for application. The required number of cells can be obtained only by *in vitro* expansion. However, a long-term culture has a negative impact on MSCs and their immunomodulatory properties. Enhancing MSCs function could increase the efficacy of MSCs-based therapies. The aim of this thesis was to determine whether mitochondrial transfer can be modulated by stimulation of MSCs with selected factors.

MSCs were treated with rapamycin, insulin-like growth factor 1 (IGF-1), interferon gamma, or oligomycin. Then the effect of these factors on mitochondria and their transfer to immune cells, metabolism, and immunomodulatory properties of MSCs was analyzed. We showed that stimulation of MSCs with IGF-1, or oligomycin leads to increased mitochondrial transfer to immune cells and that mitochondria are preferentially transferred to activated immune cells with a pro-inflammatory phenotype. The immunosuppressive effects of MSCs on T cells are maintained after stimulation of cells with IGF-1, or oligomycin.

Key words: mesenchymal stem cells, immune cells, mitochondria, metabolism, mitophagy, rapamycin, insulin-like growth factor 1, interferon gamma, oligomycin