Abstract

Retinal degenerative disease are the leading cause of vision loss in adult patients. Important role in the development of these types of disease play gradual death of retinal cells and an inflammatory reaction that leads to the production of cytokines, formation of inflamasome, increased angiogenesis and scar formation. These pathologies result in irreversible degeneration of retinal cells. Retinal pigmenetd epithelium cells, photoreceptors and ganglion cells are the most frequently damaged cell types in this conditions. The available treatments are currently very limited and effective only at the early stages of the disease. Therefore, the use of stem cell-based therapy could be a promising option. For therapeutic purposes it would be possible to use mesenchymal stem cells (MSCs) which may be isolated for example from bone marrow or adipose tissue. MSCs are capable of production of neuroprotective factors, differentiation into the variety of cells types and regulation of immune response.

In this study we tested the therapeutic potential of MSC administered locally to the damaged retina in an experimental model of retinal degeneration. We focused on the protective effect of MSCs on photoreceptor cells, regulation of the local immune response and expression of genes for cytokines involved in inflammation *in vivo*. The effect of MSCs on expression of genes for proinflammatory factors in damaged retinal cells and on the regulation of apoptosis was studied *in vitro*. We also determined the paracrine effect of MSCs on the degenerated retina and the effect of selected cytokines that are produced by MSCs. Our results indicate that MSCs can protect retinal cells, reduce the expression of genes for proinflammatory factors and decrease apoptosis. Regulation of immune response in the retinal cells may be also mediated by the paracrine effect of MSCs.

Application of MSC could therefore be an appropriate and perspective treatment for currently untreatable diseases of the retina.

Key words: Degenerative retinal diseases, mesenchymal stem cells, regulation of the immune response, neuroprotective factors