

## **Abstract**

Stem cell-based therapy represents a perspective approach for the treatment of many so far incurable diseases. Mesenchymal stem cells (MSC) are currently the most studied stem cells. They are able to differentiate into different cell types, to produce growth and trophic factors and can suppress the functions of cells of the immune system. During the study of the immunomodulatory properties of MSC, we focused on their effect on B cells. The mechanism of impact of interferon- $\gamma$  (IFN- $\gamma$ ) on MSC and their effect on the production of interleukin 10 (IL-10) by B cells was analysed. We have demonstrated that MSC-treated with IFN- $\gamma$  inhibit production of IL-10 by activated B cells via the cyclooxygenase-2 involving pathway.

Due to their regenerative and immunomodulatory properties, MSC can be for treatment of many diseases. In this study we focused on the disease and damage of the eye. The limbal stem cells (LSC) are used for the treatment of damaged ocular surface, however their isolation is difficult and they can not be used in all cases of damage. Appropriate candidates in these cases are MSC. Therefore we have decided to compare the therapeutic potential of LSC and MSC isolated from bone marrow or adipose tissue. The study have shown that MSC isolated from bone marrow have a similar regenerative effect on healing of the damaged ocular surface of the eye as have LSC.

In addition, MSC can be also used for the treatment of retinal degenerative diseases. We found that MSC are able to differentiate into cells expressing retinal markers in the environment simulating inflammation in the damaged retina and we have shown that IFN- $\gamma$  plays a key role in the differentiation process. Furthermore, we have shown that MSC produce numerous neurotrophic factors and can reduce expression of proinflammatory cytokines in the retina.