THE LASER RADIATIONEFFECT ON THE NEUROGENIC POTENTIAL OF MESENCHYMAL CELLS OF DENTAL PULP

D. Nitkin, I. Lutskaya, T. Kalinina, e-mail: info@belmapo.by
Belarusian Medical Academy of Postgraduate Education
(Minsk, Republic of Belarus)

Cell therapy is one of the promising areas of biotechnology development in medicine, which finds application in the diagnosis and treatment of cancer, autoimmune and other diseases. Methods for the production of stem cells capable of turning into any cells of an adult organism are being developed.

Japanese scientists have found that the pulp of wisdom teeth contains cell populations (MSC), which are completely identical to mesenchymal stem cells of the bone marrow. Stem cells, which demonstrated a high degree of stable development, reliability and stability were obtained from the pulp of these teeth by activating three genes. Thus, the results of the study showed a high efficiency of new methods for obtaining stem cells. Scientists consider the relative availability of obtaining the necessary material to be an important point in the study as the removal of wisdom teeth is a very common dental procedure.

At the present day mesenchymal stem cells derived from dental pulp (MSC DP) are recognized as an accessible and convenient source for autologous transplantation in regenerative medicine. The Journal of Biological Chemistry (USA, 2010) published the results of a study that states that wisdom teeth (third molars) contain valuable material for creating stem cells necessary for the treatment of serious and incurable diseases.

Stem cells derived from the pulp of wisdom teeth can be successfully differentiated into other cell types, for example, into cardiomyocytes – the main cells of the heart muscle that are used by cardiologists to treat heart disease (Kadar K., 2009). It is also shown that under certain conditions of in vitro induction MSC DP acquire the phenotype of nerve cells. The first information about the use of these cells in the treatment of middle cerebral artery occlusion in rats and stimulation of the proliferation and differentiation of neurons after transplantation of undifferentiated mesenchymal stem cells derived from dental pulp in the hypocampus of immunodeficient mice (neurotrophic effect) gives new possibilities for the potential use of mesenchymal stem cells derived from dental pulp in the treatment of cerebral apoplexy and neurodegenerative diseases. The use of standard protocols often leads to partial and reversible neurogenic differentiation of mesenchymal stem cells. Therefore, scientists' attention is focused on finding new methods that contribute to the complete differentiation of these cells in the neurogenic direction.

The positive effect of low-intensity laser radiation on proliferation, the formation of fibroblast colony-forming units, the secretion of growth factors, myogenic and osteogenic differentiation of adult mesenchymal stem cells is shown. Taking into account wide range of possible use of adult mesenchymal stem cells in the treatment of neurological diseases (injuries, neurodegenerative diseases, etc.), the

developed protocols for its extension and neurogenic differentiation are of great importance for its use in regenerative medicine.

Low-intensity laser radiation contributes to an increase in proliferative activity and contributes to stable differentiation of mesenchymal stem cells derived from dental pulp in the neurogenic direction under conditions of in vitro, which is of great importance for the production of neuron-like cells in regenerative medicine.

Enzymatic digestion method of dental pulp can be used to obtain mesenchymal stem cells derived from dental pulp. Culture-based, immunological, and molecular genetic methods of mesenchymal stem cells derived from dental pulp during growth and induced differentiation in the neurogenic direction in vitro are used.

Dose ranging and effect of low-intensity laser irradiation on mesenchymal stem cells, study of the effects of laser radiation on proliferative potential will allowto characterize the effect of low-intensity laser radiation on the differentiation potential of mesenchymal stem cells derived from dental pulp. It is expected that the use of laser radiation before neuroinduction will lead to a complete and permanent neurogenic differentiation of mesenchymal stem cells derived from dental pulp. Thus, a new method of increasing use efficacy of mesenchymal stem cells derived from dental pulp for autologous transplantation in neurological diseases can be developed. Obtained results can be used in practical dentistry, neurology, and maxillofacial surgery.