PEPTIDES AFFECT THE MATURATION OF NEURONS FROM STEM CELLS (THE NEUROGENESIS PROCESS)

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Stem cells are the precursors of all body tissue cells. They are able to self-renew, forming new stem cells, divide through mitosis and differentiate into specialized cells, turn into cells of all organs and body tissues.

Neurodegenerative diseases represent a group of pathologies characterized by dysfunctions of the central and peripheral nervous system. These diseases are characterized by progressive atrophy of nerve cells (neurons). Currently, the number of people suffering from neurodegenerative diseases is increasing every day. This is due to an increase in life expectancy, which leads to an increase in the prevalence of pathologies of the nervous system. Diseases of the nervous system lead to impaired cognitive and motor dysfunctions, which has a high social significance.

Since the beginning of neuroscience in the 19th century, scientists have been looking for ways to regenerate new neurons. The discovery of ways to protect nerve cells that are in a pathological process, as well as the possibility of restoring the functions of neurons and lost nerve synapses (cell contacts) will significantly improve the quality and duration of human life. A decrease in the number of stem cells due to bad habits, diseases and accelerated aging impairs the body functioning.

The actual direction for the treatment of patients with neurodegenerative diseases is the search for methods that provide neurotransplantation of stem cells into the damaged area of the nervous system. Promising neuroprotectors are peptide bioregulators with high physiological activity and the ability to regulate the expression of various signaling molecules. In addition, peptide bioregulators are characterized by trophic, growth, anti-inflammatory, mediator and effector properties and have no side effects.

Based on the analysis of the amino acid composition of the polypeptide complex Endoluten®, isolated from the extract of the cattle epiphyses, the tetrapeptide Epitalon® (Ala-Glu-Asp-Gly, AEDG) was synthesized. Epithalon® stimulated the proliferation of retinal and pigment epithelium cells in rats (tissue

growth, an increase in the number of cells). The tetrapeptide affected the differentiation of the early gastrula ectoderm stem cells of the frog *Xenopus Laevis*. Epitalon® stimulated differentiation of stem cells into nervous tissue and epidermis. Differentiation is the development of cells specialized functions process. Histological examination of the chickens` retina also indicates the retinoprotective effect of the tetrapeptide. The addition of AEDG to an organotypic cell culture in combination with KE dipeptide contributed to a statistically significant increase in the expression level of retinal neuron markers (Brn3, Prox1, Vsx1, Pax6) and a marker of retinal pigment epithelium cells (TTR), which are essential for the nervous system cells signaling.

Based on the analysis of the amino acid composition of the polypeptide complex Ventfort® isolated from the extract of cattle vessels, the tripeptide Vesugen® (Lys-Glu-Asp, KED) was synthesized. Using modern methods of molecular biology, it has been demonstrated that AEDG and KED peptides induce neurogenic differentiation of stem cells (cells transformation into functional neurons). Peptides increase nestin, β-tubulin III, GAP43, doublecortin gene expression and protein synthesis. These proteins are essential for the normal functioning of the nervous system. They provide signal transmission of information from cell to cell, interaction and communication of brain cells with each other.

Thus, stimulation by short peptides of stem cell differentiation in the neurogenic direction can be used in replacement therapy, regenerative medicine, which will lead to a decrease in the number of age-associated neurodegenerative diseases. Generation of new neurons from stem cells by peptides affecting may become a promising treatment option for patients with impaired nervous system functions.