The use of stem cells in medicine

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Introduction. One of the topical issues in current biotechnology research is the study of different types of stem cells, which opens up significant prospects for the treatment of serious incurable diseases such as diabetes, cardiovascular disease, neurodegenerative diseases, and others.

Materials and methods. During the research a number of scientific publications on the issues of scientific intelligence, materials of periodicals, Internet resources were used. In the work the complex research methodology is formed, which is based on the general principles and methods of system analysis. The analytical description of biotechnological aspects of the use of mesenchymal, embryonic, stromal and induced pluripotent stem cells is based on the methods of morphological analysis and synthesis of systems using elements of general scientific (abstraction, generalization, formalization) and empirical analysis.

Results of research. The first report on the presence of stem cells was brought to the scientific community by Russian histologist O.O. Maksimov, who in 1908 introduced the term "stem cell" to explain the mechanism of rapid self-healing of blood cells.

Naturally, embryonic stem cells are excreted from the embryo. The ability to isolate human embryonic cells from blastocysts and to grow them in culture depends largely on the integrity and condition of the blastocyst from which the cells are derived. Embryonic stem cells are obtained mainly in the form of a hollow ball from the internal cell mass of blastocysts, which are formed in a person three to five days after ovum fertilization with sperm. The blastocyst of a person is approximately the size of a dot. With the normal development of cells within the inner cell mass, more specialized cells are generated that give birth to the whole body - all our tissues and organs. However, when scientists isolate the internal cell mass and grow these cells in special laboratory conditions, they retain the properties of embryonic stem cells. Embryonic stem cells are pluripotent, that is, they can generate every cell type in a fully formed body except the placenta and umbilical cord. A special feature of these cells is that they do not express HLA (human leucocyte antigens), i.e. they do not produce tissue compatibility antigens. This makes it possible to transplant them with a low risk of rejection. These cells are incredibly valuable as they provide a renewable resource for disease study and development, as well as for drug testing and other treatments. Also note that the most important disadvantage of embryonic stem cells is the impossible autologous use in transplantation, as the selection of these cells is incompatible with its development in ontogeny.

Japanese scientists have proven that bone marrow stem cells have potential of oncogenic activity. In preparation for treatment, the patient is removed by a small puncture bone marrow bone volume that contains stem cells. The stem cell sampling procedure is absolutely safe for the patient. The physician then injects the solution into the treatment site. Cells multiply and take over the functions of diseased tissues, and the results are amazing!

Conclusions. Stem cells are already used for cancer, diabetes, Parkinson's disease and heart failure treatment. They are also increasingly used in the treatment of musculoskeletal system. The analysed data in this review indicate the need for more in-depth biotechnology research and the use of stem cells in biotechnology and regenerative medicine.

References:

1. Liao, J., Cui, C., Chen, S., et al. Generation of induced pluripotent stem cell lines from adult rat cells // Cell Stem Cell, 2009. P. 11–15.