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Treatment of the amyotrophic lateral sclerosis using of genetically modified umbilical cord blood mononuclear cells in the preclinical studies

Rizvanov A., Guseva D., Salafutdinov I., Bashirov F., Kiiasov A., Islamov R.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Development of the fundamental and clinical «regenerative medicine» is based on the progress of gene, stem cell and gene-cell biotechnologies. However, the reliable preclinical investigations on animal models and more over clinical trials stay far away from the available nowadays gene and cell constructions. Neuroscience is one of the fast growing fields of knowledge in biology and medicine. Pioneer experiments in neuroscience promises breakthrough in the innovative methods for treatment of neurodegenerative diseases in near future. This review addresses strategies for gene-cell therapy of neurodegenerative diseases by the example of amyotrophic lateral sclerosis. Precisely gene modification of mononuclear fraction of umbilical cord blood cells (UCBC) by dual cassette plasmid vectors is observed. Based on our own results of transplantation of genetically modified UCBC overexpressing recombinant neural cell adhesion molecule L1, vascular endothelial growth factor, fibroblast growth factor 2, and glial derived neurotrophic factor in different combinations we provide the experimental data for usefulness of transplantation of gene modified UCBC for treating neurodegenerative diseases. In the review we discuss the efficacy of gene modification of UCBC not only for secretion of recombinant proteins, but in increasing of transplanted cells survivability, their migration possibilities and capability to differentiate in endothelial, microglial and macroglial cell types.

Keywords

Dual cassette plasmid vectors, Gene-cell constructions, Regenerative medicine, Umbilical cord blood cells