
NEW TREATMENT STRATEGY AGAINST ISCHEMIC BRAIN DAMAGE BASED ON COMBINED APPLICATION OF STEM CELL THERAPY AND PLANT POLYPHENOLS

**T.T. Nurkenov¹, A.K. Tsoy², G.E. Zhusupova¹, F.S. Olzhayev², V.B. Ogay³, B.A. Umbayev²,
T.M. Shalakhmetova¹, Sh.N. Askarova²**

¹*Al-Farabi Kazakh National University (Almaty, Kazakhstan)*

²*National Laboratory Astana, Nazarbayev University (Nursultan, Kazakhstan)*

³*National Center for Biotechnology (Nursultan, Kazakhstan)*

nurkenovtulendy@gmail.com

Keywords: mesenchymal stem cells, stroke, *Limonium Gmelinii*, polyphenols, rat

Introduction: There is a number of data indicating that plant polyphenols can provide protection against neurodegenerative changes associated with cerebral ischemia. On the other hand, it has been shown that application of bone marrow-derived mesenchymal stem cells (BM-MSCs) resulted in an improved functional recovery in animal models of cerebral ischemia and stroke by modulating the inflammatory response, and stimulating endogenous neurogenesis and angiogenesis. Thus, we hypothesized that neuroregenerative potential of mesenchymal stem cell therapy could be significantly improved if applied in combination with plant polyphenols. We applied extract of *Limonium Gmelinii* (a plant widespread in Kazakhstan) as a source of plant polyphenols.

Methods: 25 female Wistar rats were used in this study (weight 280-300g). Ischemic stroke was induced in 20 animals by occlusion of the middle cerebral artery (MCAO); 15 animals received either *Limonium Gmelinii*, or BM-MSCs, and both; untreated and intact animals served as controls. The day before the induction of stroke, the next day, on the 14th and 28th days after MCAO the sensorimotor functions of the animals were evaluated. Before transplantation, BM-MSCs were transfected with lentiviral particles.

Results: The distribution of the transfected MSCs inside the body of laboratory animal with MCAO was shown to be different from the distribution of MSCs inside the body of intact rats (control group). In control rats all the MSCs were localized in visceral organs, while in rats with surgically induced MCAO some amount of cells was found in the brains. Daily treatment of rat with 200 mg/kg of *Limonium Gmelinii* extract for 28 days or single transplantation of MSC (5x10⁶ cells) showed partial restoration of the locomotor function of the animals while combined therapy with *Limonium Gmelinii* and MSCs completely restores it by 28th day.

Conclusion: Combined therapy with extract of *Limonium Gmelinii* and mesenchymal stem cells is a more effective approach in comparison to monotherapy.