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Human adipose-derived stem cells stimulate neuroregeneration

Masgutov R., Masgutova G., Zhuravleva M., Salafutdinov I., Mukhametshina R., Mukhamedshina Y., Lima L., Reis H., Kiyasov A., Palotás A., Rizvanov A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015, Springer-Verlag Italia.Traumatic brain injuries and degenerative neurological disorders such as Alzheimer's dementia, Parkinson's disease, amyotrophic lateral sclerosis and many others are characterized by loss of brain cells and supporting structures. Restoring microanatomy and function using stem cells is a promising therapeutic approach. Among the many various sources, adipose-derived stem cells (ADSCs) are one of the most easily harvested alternatives, they multiply rapidly, and they demonstrate low immunogenicity with an ability to differentiate into several cell types. The objective of this study was to evaluate the effect of xenotransplanted human ADSCs on post-traumatic regeneration of rat sciatic nerve. Peripheral reconstruction following complete sciatic transection and autonerve grafting was complemented by intra-operative injection of hADSCs into the proximal and distal stumps. The injury caused gliosis and apoptosis of sensory neurons in the lumbar 5 (L5) ganglia in the control rodents; however, animals treated with hADSCs demonstrated a smaller amount of cellular loss. Formation of amputation neuroma, which hinders axonal repair, was less prominent in the experimental group, and immunohistochemical analysis of myelin basic protein showed good myelination 65 days after surgery. At this point, control groups still exhibited high levels of microglia/macrophage-specific marker Iba-1 and proliferating cell nuclear antigen, the mark of an ongoing inflammation and incomplete axonal growth 2 months after the injury. This report demonstrates that hADSCs promote neuronal survival in the spinal ganglion, fuel axonal repair and stimulate the regeneration of peripheral nerves.

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Keywords

Autonerve graft, Human adipose-derived stem cell (hADSC), Peripheral nerve injury, Regenerative medicine, Repair, Xenotransplantation