Bone marrow-derived mesenchymal stem cells transplantation produces a tissue recovery in hydrocephalic mice

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In congenital hydrocephalus, cerebrospinal fluid accumulation is associated to ischemia/hypoxia, metabolic impairment, neuronal damage and astrocytic reaction, which cause significant mortality and life-long neurological complications. Currently, there are no effective therapies for congenital hydrocephalus. Bone marrow-derived mesenchymal stem cells (BM-MSC) are considered as a potential therapeutic tool for neurodegenerative diseases due to their ability for migrating and producing neuroprotector factors when they are transplanted.

The aim of this research was to study the ability of BM-MSC to reach the degenerated regions and to detect their neuroprotector effects, using an animal model of congenital hydrocephalus, the hyh mouse.

Fluorescent BM-MSC were analyzed by flow-cytometry and multilineage cell differentiation. BM-MSC were brain-ventricle injected into hyh mice. Wild-type and saline-injected hyh mice were used as controls. Inmunohistochemical, RT-PCR and High Resolution Magic Angle Spinning spectroscopy (HRMAS) analyses were carried out.

After administration, integrated BM-MSC were identified inside the periventricular astrocyte reaction. They were detected producing glial-derived neuroprotector factor (GDNF), neural growth factor (NGF), and brain-derived neuroprotector factor (BDNF). Tissue recovery was detected with a reduction of apoptotic cells in the periventricular walls and of the levels of glutamate, glutamine, taurine, and creatine, all of them markers of tissue damage in hydrocephalus.