Characterization and administration of bone marrow-derived mesenchymal stem cells in an animal model of congenital hydrocephalus

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Bone marrow-derived mesenchymal stem cells (BM-MSC) are considered as a potential therapeutic tool in neurodegenerative diseases, due to their ability to migrate to degenerated tissues and the production of growth factors. Congenital hydrocephalus is a disorder characterized by a degeneration of the periventricular cerebral parenchyma and the white matter. In the present study, using an animal model of congenital hydrocephalus, the hyh mouse, it has been studied the capacity of the BM-MSC to reach the degenerated regions exhibiting glial reactions and their probable neuroprotector effects.

The BM-MSC were isolated from two sources: a) transgenic mice expressing the monomeric red fluorescent protein (mRFP1); b) wild type mice. In the second case, the BM-MSC were labelled in vitro using bromodeoxyuridine, a fluorescent cell tracker and the lipophilic DiR. Before application, the cells were analysed using flow cytometry and immunofluorescence. The BM-MSC were injected into the retro-orbital sinus or into the lateral ventricle of hyh mice. After 24/96 hours of administration, they were detected under light, confocal and electron microscopes.

The injected BM-MSC reached the degenerated periventricular regions and the disrupted neurogenic niches. They were detected in the periventricular parenchyma, around periventricular blood vessels and in the ventral meninges. Most of the applied BM-MSC expressed the glial cell-derived neurotrophic factor (GDNF), in the same way as the periventricular reactive astrocytes, suggesting a possible neuroprotector effect.

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