Recently biomaterials have been used to create 3D micro scaffolds, such as the one named “Nichoid”, which mimics the biomechanical characteristics of stem cell niches. The aim of this study was to investigate the proliferation, differentiation and stemness properties of neural precursor cells (NPCs) and the therapeutic effect and safety in vivo of NPCs grown inside the niches in preclinical experimental model of Parkinson’s Disease (PD).

Nichoids were fabricated by two photon laser polymerization using a photosensitive resin. NPCs were grown for different periods inside the Nichoid and cells features were characterized by Real Time PCR analysis, immunofluorescence and Western Blot. Parkinsonism was induced by the intraperitoneal administration of MPTP in C57/black mice by using an acute protocol.

NPCs grown inside the Nichoid create a 3D carpet and, 7 days after plating, cells show a significantly higher proliferation than in normal floating culture conditions. NPCs expanded inside the Nichoid maintain their biological features and show an increase in stemness potential, as demonstrated by Real Time-PCR, Western Blot, immunofluorescence and methylation assay. The therapeutic effect and safety of Nichoid-grown NPCs was evaluated by their intrastriatal infusion in PD affected mice. Behavioral performances were evaluated with two different tests showing that Nichoid-grown NPCs promoted the recovery of PD symptoms and favor the expression of tyrosine hydroxylase in the pathology affected brain areas.

Stem cells show an increase in stemness potential when grown inside the Nichoid, demonstrating great promise and strong application in the field of regenerative medicine applied to neurodegenerative disease.

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